FOUNDRY TRADE JOURNAL
Established 1902
WITH WHICH IS INCORPORATED THE IRON AND STEEL TRADES JOURNAL

Vol. 85 Thursday, November 18, 1948 No. 1681

49, Wellington Street, London, W.C.2
'Grams: "Zacatecas, Rand, London"
'Phone: Temple Bar 3951 (Private Branch Exchange)
PUBLISHED WEEKLY: 26s. per annum (Home and Overseas)

Establishing Efficiency

Last week, the Institution of Production Engineers organised a conference, the object of which was to establish a basis for the ascertainment of factory efficiency. As we write, we have no report of this meeting, but we shall be both surprised and delighted if a concrete system is established. Rough methods, such as production per unit floor space; per man-hour and per machine-hour, are already well known, but they supply comparable figures in only very limited fields. On such data, however, we fear the relative efficiency of a shop making jobbing castings and an electric-lamp factory could not be established. Again, is efficiency to be related to the plant installed or to what is available through capital investment? It is conceivable that from one angle an old-fashioned shop may be more efficient than one thoroughly modernised. We have personally on occasion noted such conditions.

This problem of efficiency and its improvement has been exercising the minds of foundry executives ever since the industry was established, but more recently it has been stressed by Government pressure and accepted by the general trend of modern thought. One method, which appeals to us as being practical, is that proposed by the South of England Ironfounders' Association. From their own membership they have created a panel of the best people available to investigate (after the receipt of a request) and advise on four quite different aspects of foundry practice. These aspects are detailed under the following headings:—(1) Business management; layout; and plant. (2) Practical foundry technique and metallurgy. (3) Working conditions; amenities; personnel relations; and training. (4) Finance; accounting; and costing. A request may be for only one or several of the phases listed. This is sensible, for most firms are conscious of weakness under one of the headings. Some may be worried as to the efficacy of their costing; others about just what they could and should do about amenities, whilst technological troubles of a permanent or transitory character may be the major worry. The panel members would report back to the foundry visited and it is specifically laid down that, where true efficiency is encountered, this should be described and stressed side-by-side with inefficiency. A copy of these reports is also to be sent to the secretaries, who will, whilst eliminating all names, prepare a *précis* for distribution from time to time to members. No doubt, members of the panel encountering technological difficulties which they believe to be of a type calling for investigation, will draw attention to the free services given by the British Cast Iron Research Association. This may be reminiscent of "teaching grandmother to suck eggs," yet, as we travel about the country, we are constantly finding foundrymen making appeals for the institution of what is already available. This applies with great force to educational and training activities.

Whilst we make no claim that herein lies a solution to the ascertainment of an efficiency index, we do believe that through such visits as we have indicated, the ordinary ironfoundry would improve its business and manufacturing methods. Executives spending most of their working days in one environment tend to become myopic, the cure for which is not a visit to the optician, but visits from colleagues within the industry, pledged to give impartial advice—always remembering that but few are in competition.

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Correspondence

[We accept no responsibility for the statements made or the opinions expressed by our correspondents.]

CARDING MACHINE CASTINGS

To the Editor of the FOUNDRY TRADE JOURNAL.

DEAR SIR,—If the inquirer from China (October 28 issue) could be shown Mr. E. Longden's Paper, entitled "Some Interesting Moulding Jobs" in I.B.F. proceedings for 1928-29, pages 828-834, he would see how Carding Engine Cylinders can be made. Judging by Mr. Longden's Paper, the inquirer's method seems to be hopelessly wrong.

Yours, etc.,

D. ROGERS.

Hon. Sec., West Wales Section, Wales and Monmouth Branch of the Institute of British Foundrymen.

[Other answers, which require the preparation of sketches, will be published in the near future.—EDITOR.]

British Standards Institution

The Monthly Information Sheet for September, just received, lists, under "New Standards Issued," 1121, Part 8, Methods for the analysis of steel; chromium present in small amounts in carbon and low-alloy steels (1s.); 1469, Coal tar liquid fuels (2s. 6d.), and 460 and 1205, Cast-iron rainwater goods (5s.). This last-named Standard is an amalgamation of B.S. 460:1944—"Cast-iron half-round gutters" and B.S. 1205, Part Two—"Cast-iron O.G. gutters." It gives precisely the same technical requirements as were included in the separate specifications, the alterations having been limited to those required for presenting the information concisely. Three grades of rainwater pipes are covered by the standard, light, medium and heavy, in sizes from 2 in. to 6 in., together with fittings and accessories; half-round gutters in sizes from 3 in. to 6 in. and O.G., gutters in 4-in., 4½-in. and 5-in. sizes. The general clauses deal with quality of materials, freedom from defects, facilities for inspection, marking and rejection. Dimensions, weight, thickness, sockets, ears, hammer test and finishes relating to pipes and with dimensions, thickness and finish relating to gutters are dealt with in "specific" clauses.

Under the heading "Amendment Slips Issued," there is PD.822, Amendment No. 2 to B.S. 1125:1945, w.c. flushing cisterns.

The Borough Polytechnic

From the advertisement column we learn that permission has been given by the London County Council to appoint a full-time teacher in foundry practice to replace what was a part-time appointment. In recent months, the position became so difficult that the second and third classes had to be temporarily abandoned. We hope that as result of this advertisement the vacant position will be quickly filled and the excellent programme of instruction being carried out at the Borough will be resumed.

Forthcoming Events

(Secretaries are invited to send in notices of meetings, etc., for inclusion in this column.)

NOVEMBER 22.

Institution of Production Engineers.

Derby Sub-Section :—"Die-casting," by H. W. Fairbairn, at the Art School, Green Lane, Derby, at 7 p.m.

Manchester Section :—"Working Pace and Incentives," by Lewis C. Ord, at the Manchester College of Technology.

NOVEMBER 23.

Institute of British Foundrymen.

Slough Section :—"Roller Conveyors in the Foundry," by J. W. Gardom, at the Lecture Theatre, High Duty Alloys, Limited, Slough, at 7.15 p.m.

Institution of Works Managers.

London Branch :—"Motion Study," by Miss A. G. Shaw, at the Waldorf Hotel, Aldwych, London, W.C.2, at 6.45 p.m.

NOVEMBER 24.

Institute of British Foundrymen.

London Branch :—"Is Foundry Mechanisation Worth-while?", talk and film by J. W. Gardom preceding an open Discussion. At the Waldorf Hotel, Aldwych, London, W.C.2, at 7.30 p.m.

NOVEMBER 25.

Institute of Welding

Joint Meeting with the Institution of Structural Engineers, at 11, Upper Belgrave Street, London, S.W.1. "Curved Bridges, and why they should be Welded," by H. Gottfeldt, at 6 p.m.

Shipley Technical Institute Engineering Society

Film Exhibition, "Wheels behind the Wheels," at the Shipley Technical Institute, Exhibition Road, at 7.30 p.m.

The Institute of Metals.

Birmingham Local Section :—"High Temperature Measurements," by T. Land, M.A., at the James Watt Memorial Institute, Great Charles Street, Birmingham, at 6.30 p.m.

Royal Statistical Society—Industrial Applications Section.

Sheffield Group :—"Some Uses of Elementary Statistics in the Refractories Industry," by K. Cowling, in Room B.1, the University, St. George's Square, Sheffield, 1, at 6.30 p.m.

NOVEMBER 26.

Institution of Production Engineers.

Lincoln Sub-section :—"Quality Control," by E. D. Van Rest, at the Lincoln Technical College.

NOVEMBER 27.

Institution of Mechanical Engineers

Yorkshire Branch, Graduate Section :—Visit to John Fowler & Company (Leeds), Limited, Hunslet Road, Leeds. Meet at factory entrance 2.30 p.m.

S. W. Wise Memorial Award

The West Riding of Yorkshire branch of the Institute of British Foundrymen have announced conditions governing the award of the S. W. Wise Memorial Prize. The subject matter must deal with (*a*) cupola practice, (*b*) core-shop practice, (*c*) mechanisation, or, (*d*) a foundry process applied to three specific castings for which the drawings are supplied. Full particulars may be obtained from the Hon. Sec. of the branch, to whom entries must be posted before January 1, 1949.

ACCORDING TO THE "Iron Age," recent research in the U.S.A. has suggested that magnesium may be superior to cerium for developing nodular graphite structures in cast iron. Best alloy to date appears to be a magnesium-copper with more than 50 per cent. copper. A ladle addition of 1.25 per cent. of a 50 per cent. nickel-50 per cent. magnesium alloy followed by 0.4 per cent. silicon is expected to give 40 tons per sq. in. tensile strength and 223 brinell hardness. Magnesium was found to be effective in the low-carbon iron while cerium appears to be effective only in hypereutectic iron.

Steel Castings for Aircraft*

Problems attending the Production of complicated Components

By E. J. Brown, A.I.M. and F. Rodgers, A.Met., A.I.M.

Introduction

Ten years ago the introduction of a casting as a main structural member in the fuselage of a British aeroplane would have been regarded as a bold adventure and not in keeping with the high material standards of the aircraft industry. It was known, however, at this period that the Germans were investigating this field of manufacture, probably in view of their pre-knowledge of the impending conflict, and examination of captured aircraft in the early stages of World War II proved they had successfully developed a technique capable of producing castings of a quality hitherto thought impossible. British aircraft manufacturers recognised the potential advantages of castings for items not readily producible in the form of forgings or alternatively by fabrication, and in view of production requirements, steel-founders were asked to consider the manufacture of castings which were not stressed in flight.

It was evident at the outset that concepts governing the manufacture of castings on a commercial basis would have to be revised in view of the extremely rigid requirements regarding material quality and freedom from minor defects. The extent of testing, together with the material specification, was dictated by individual requirements, standards of acceptance being the subject of close collaboration between the designer and founder, particular attention being paid to the location of highly-stressed areas.

The obvious necessity for keeping the weight/load ratio as low as possible is uppermost in the mind of the aircraft designer, the prime requirements, however, being that the castings should be capable of withstanding a suitable proof load at his dictation. A further factor to be considered is usually the necessity for conforming to certain leading dimensions sometimes based on the earlier use of forgings or fabricated parts.

The success attending the manufacture of castings not stressed in flight resulted in the production of components forming part of the actual aircraft structure and consequently subject to high loading during actual flight. Comparatively recent developments include the production of castings by centrifugal means, and it will be appreciated that the field now covered is so wide that space limitations do not permit of an over-all survey.

It is, therefore, proposed to limit this Paper to the problems encountered in the production of the rear spar and pivot bracket for the Hawker "Tempest" and "Typhoon," respectively, and the methods adopted to overcome them in the foundry with which the authors are associated. A typical group of castings including the pivot bracket is shown in Fig. 1.

Pivot Bracket

The pivot bracket is reputed to be the first stressed steel casting to be incorporated into the body of British aircraft, although attention is drawn to the fact that it is not stressed in actual flight. Two brackets are required for an aircraft, port and starboard, each being bolted on two sides and containing two bosses which are designed to engage a tubular spindle which acts as the hinge for the retractable leg.

The part which is illustrated in Fig. 1 is liable to be highly stressed and subjected to heavy shock loads in service during landing and take-off.

The pivot bracket briefly described consists of an angle plate 9½ in. and 12 in. in length by 9 in. in width by ¼ in. in thickness, to which is attached a boss 3 in. in diameter on one leg of the angle, with a torque tube (¼ in. in thickness) carrying the other boss and a radial rib 0.20 in. in thickness.

It will be apparent to experienced steel foundrymen that the production of such a casting, of a quality beyond question, was no easy matter, and numerous trials

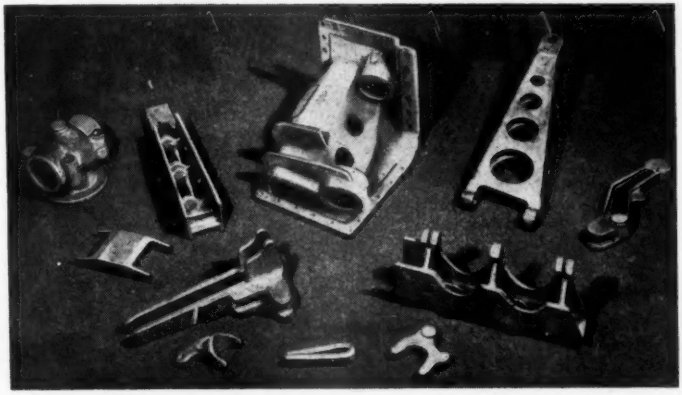


FIG. 1.—TYPICAL GROUP OF AIRCRAFT CASTINGS SHOWING PIVOT BRACKET (TOP CENTRE).

*Presented at the London Conference of the Institute of British Foundrymen, June, 1948.

Steel Castings for Aircraft

took place before a satisfactory production technique was evolved. The standard required was absolute freedom from surface cracks, shrinkage or other defects, this necessitating routine examination by X-ray and magnetic crack detecting, the latter in conjunction with cadmium plating.

Steel Selected

The design of the casting was such that whilst mechanical properties were a governing factor, careful consideration had to be given to the question of a steel suitable from a fluidity aspect. Carbon and low alloy steels containing chromium and molybdenum were tried with indifferent results from a foundry point of view, and further investigations were carried out on steels containing approximately 2 per cent. Cu; these indicated that this was the most suitable type of material.

The composition finally chosen was as follows:—Carbon, 0.18 to 0.22; silicon, 1.0 to 1.25; manganese, 0.9 to 1.1, and copper, 1.9 to 2.1 per cent, which, after a normalising and tempering treatment, is capable of meeting desired specification, *i.e.*, maximum stress, 40 tons per sq. in.; yield point, 25 tons per sq. in.; elongation, 15 per cent. on 2 in.; reduction of area, 20 per cent., and impact test, 16 ft./lb. Izod.

Moulding Technique

The development of a suitable moulding technique necessitated much exploratory work as to the type of sand and the location of chills, feeder heads, etc., and whilst space does not permit of a comprehensive survey of this work, special reference should be made to the methods of overcoming two major problems arising in the course of manufacture. It was apparent in the early stages that the junction of the torque tube and back plate was particularly prone to the incidence of hot-tears, and various methods of chilling were employed with varying results, the method finally adopted being the introduction of nails which served to reinforce the mould and serve as multiple chills. A further feature was the use of green sand (air dried) for the torque tube core, this being rendered necessary to ensure maximum collapsibility. The use of such a core brought in its train practical difficulties on account of its fragile nature, these being overcome by employing tracing cloth to lower it into position in order to obviate handling as much as possible.

Conventional sands were used for the outside segmental cores (stove dried) and the mixture finally adopted for the air-dried core mentioned above, is given below, together with the progressive increase in strength obtained by air-drying:—

Sand Mixture for Air-dried Core.

Chelford silica sand	92 per cent.
Bentonite	2 "
Cereal bond	2 "
Water	4 "

Properties:

Moisture, per cent.	Permeability, No.	Time Air-drying, Hr.	Crushing Test, Lb./sq. in.
3.8	150	—	5.1
—	—	1	20.0
—	—	2	26.0
2.3	—	3	36.0
1.9	—	4	39.0

The relative weight of the casting to the fluid steel employed in its manufacture serves to emphasise the extensive feeding necessary, the machined weight of the finished part being 28½ lbs., representing a yield of approximately 20 per cent.

The Rear Spar Casting

The rear spar casting illustrated by a perspective sketch (see Fig. 2) is a load-carrying member of the

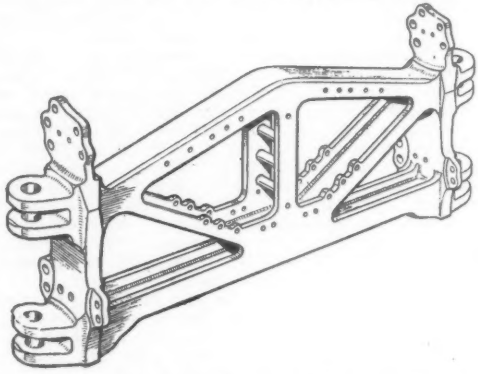


FIG. 2.—REAR SPAR—SKETCH OF FINISHED CASTING.

"Tempest" aircraft. Its most important function is to serve as an anchor for the trailing edges of the wings, and consequently it is subject to high stresses in actual flight. It is of interest to recall that the design was modified by mutual arrangement, in order to conform with the best-known foundry technique. For instance, the designers originally submitted girders of X-section and, on being acquainted of the difficulties of ensuring soundness, agreed to the adoption of a U-section.

The moulding layout illustrated in Fig. 3 gives some indication of the feeding necessary to ensure the desired degree of soundness. The finished weight of the casting was 115 lb. The amount of fluid steel used was approximately 728 lb., thus giving a yield of 14.4 per cent. With further regard to the U-section, centre-line structural weakness was to a large extent eliminated by padding, as illustrated in Fig. 4.

Moulding

Particular care was taken in the production of the pattern and the core-making equipment in order to ensure a high degree of accuracy, three sets of core-boxes being made. The arrangement was that one set could be reconditioned whilst the other two were in use. Jigs were made in order to check dimensionally both cores and assembled moulds.

The moulds were made on a 4,000-lb. Pneulec-Hermann jolt roll-over machine, as shown in Fig. 5, the sand being bentonite-bonded synthetic mixture painted with silica paint and dried.

Choice of Steel

The question of material analysis was considered in the light of the sections involved and specification requirements, together with the founding aspects, and it was decided that a chromium-molybdenum steel having the following approximate composition would be suitable: Carbon, 0.23; silicon, 0.45; manganese, 0.65; chromium, 1.0, and molybdenum, 0.20 per cent.

Preliminary trials with this grade of steel indicated that it was fully capable of meeting all requirements, after subjection to water quenching and tempering, and typical test pieces taken from an actual casting are illustrated in Fig. 6.

It was realised that such a steel would be very prone to mass effect in heat treatment, and in view of this, preliminary machining operations were carried out after annealing in order to reduce sections as much as possible. A series of exploratory tests to investigate this tendency in varying sections were carried out, the results of which are illustrated in Fig. 7.

The necessity for steel of the highest quality clearly pointed to the application of the basic arc-furnace, by reason of its comparative cleanliness and flexibility of temperature control. This method was, therefore, employed, the charge being worked by the conventional double-slag process. All heats were poured from a bottom-pouring ladle, a 2-in. diameter fireclay nozzle being used.

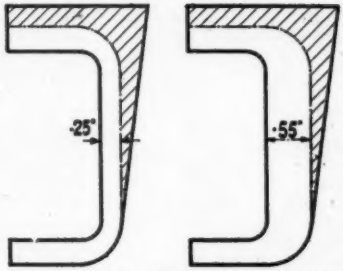


FIG. 4.—THE METHOD OF PADDING ADOPTED.

After Treatment

The castings immediately after stripping were subjected to an annealing at 950 deg. C., after which they were fettled and examined dimensionally by means of jigs, this forming the preliminary inspection prior to special requirements for this class of work. Following approval, the spars were further trimmed and ground in the radii and finally shot blasted in order to give a good clean surface for crack detection. For this latter purpose castings were placed in the machine and

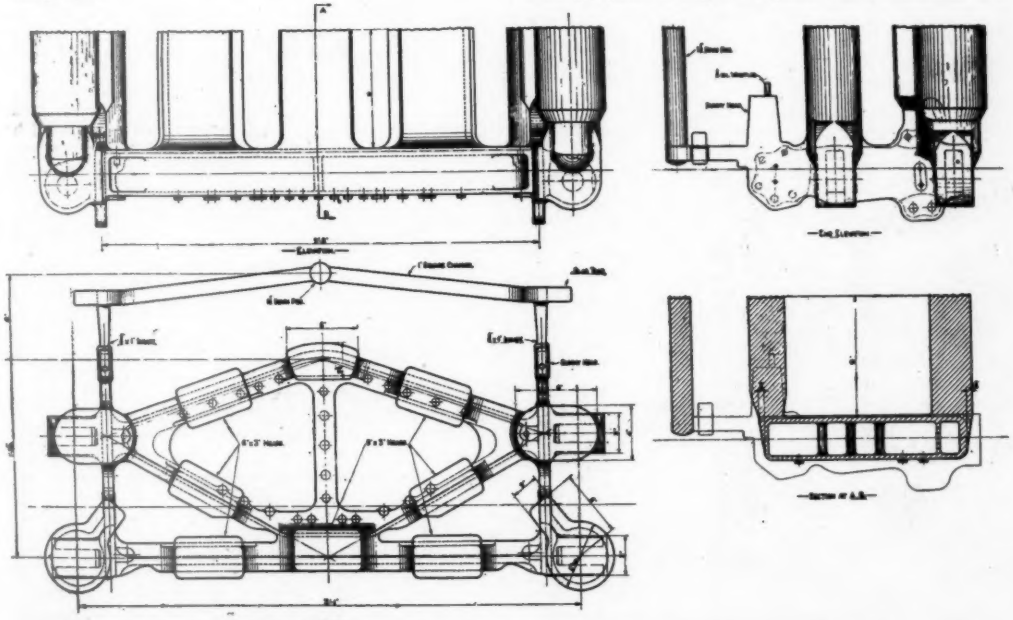


FIG. 3.—REAR SPAR CASTING, SHOWING METHOD OF RUNNING, MOULDING AND FEEDING.

Steel Castings for Aircraft

A.C. current was passed through to reveal longitudinal cracks. In addition, the magnetic flux from a large D.C. core was applied to reveal any transverse cracks, crack detecting ink being sprayed to disclose defects which might otherwise have passed undetected.

The castings were then rough machined, and in company with their appropriate test-bars were heated to a temperature of 910 deg. C. and quenched in water. During the quenching the castings were held in a frame to minimise distortion; the quenching was followed by tempering at 550 deg. C., and cooling in air.

Tensile and Izod tests were required to meet the following minimum values:—0.10 per cent. proof stress, 43 tons per sq. in.; maximum stress, 55 tons per sq. in.; elongation, 12 per cent. on 2 in.; Izod value, 25 ft. lb.; and Brinell hardness number, 262 to 302.

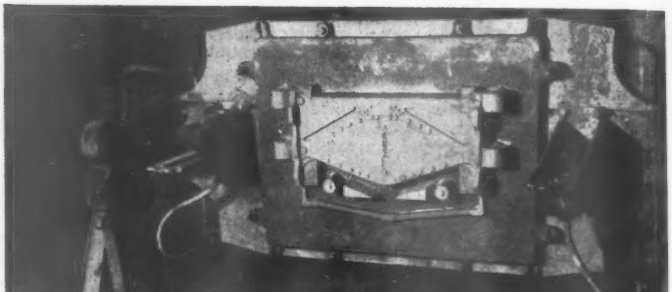


FIG. 5.—MACHINE MOULDING OF THE REAR SPAR.

Following heat-treatment, the castings were checked for hardness and then examined for alignment and, if necessary, corrected. They were then shot blasted to remove treatment scale and submitted for a second crack-detection operation.

De-magnetisation was carried out before machine finishing. In order to determine whether any further cracks had been revealed by machining, a third crack-detection was carried out, after which, if satisfactory, they were subjected to a proof loading test.

Wastage

The inspection procedure evolved in order to control the castings in all stages of manufacture was such that any faults arising in manufacturing technique could be

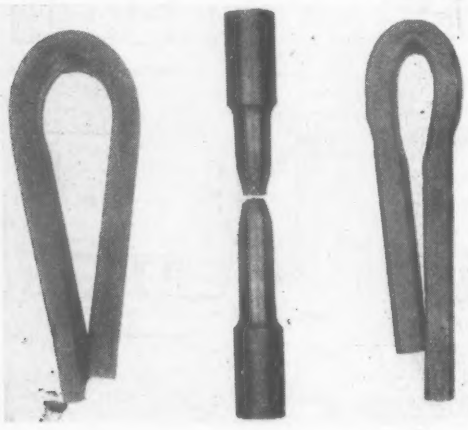


FIG. 6.—TENSILE AND BEND SPECIMENS MACHINED FROM A REAR SPAR CASTING.

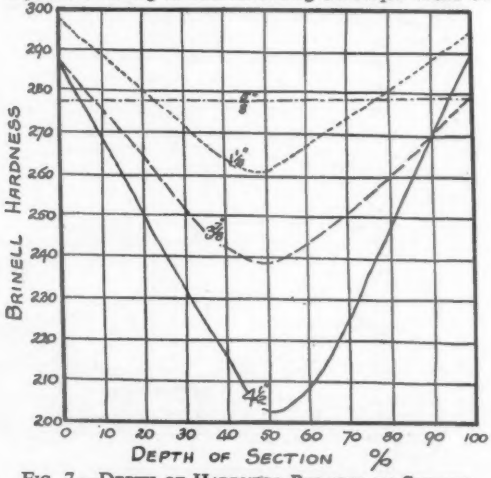


FIG. 7.—DEPTH OF HARDNESS RELATED TO SECTION FOR REAR SPAR CASTING MATERIAL.

located and corrected immediately, any unsuitable castings being withdrawn and scrapped at the appropriate stage. Waster castings may be classified into three groups as shown in Table I.

Defective Tabs

Reference to Table I will show that the most prominent type of defect is that associated with tabs. The tabs in question, which are uppermost as cast, are shown in outline in the end elevation (Fig. 3). A number of changes were made before perfect soundness was obtained. In the first instance the part was extended, a narrow vent being attached; the results of this experiment were most unsatisfactory. The part was then linked up with the adjacent head, with very indifferent results. Finally, after various other expedients were tried, success was obtained following the somewhat expensive procedure of incorporating the part within the head. The type of defect encountered, which was attributed to the evolution of dissolved gas on solidification, was disclosed by means of X-ray as illustrated in Fig. 8.

TABLE I.—*Causes for Rejects.*

Inspection Stages.	Defects Causing Rejection.	Rejected.	Totals.
		Per cent.	Per cent.
I	Unsuitable composition ..	0.8	
	Misrun or lapped	4.3	
	Defective tabs	6.8	11.9
II	Sand and slag	0.6	
	Error in machining	2.0	
	Cracks	2.4	5.0
III	Defect revealed after finish machining		1.6
		Total ..	18.5

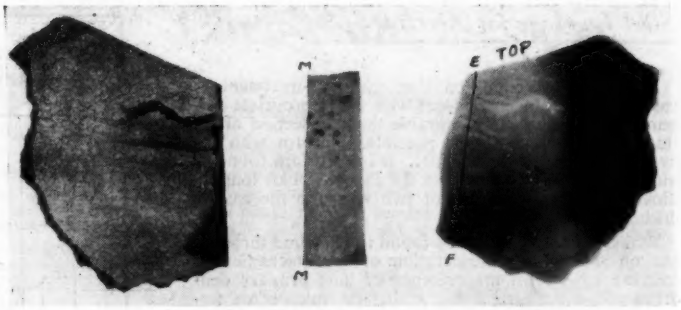


FIG. 8.—X-RAY IDENTIFICATION OF CAVITIES (RIGHT) AND RESULT AFTER SECTIONING (LEFT AND CENTRE).

Proof Loading

It was agreed that whilst the use of X-ray was necessary to develop and control the manufacturing technique, for which purposes it was found to be invaluable. The most critical specification was that of an applied proof loading test. For this purpose a machine was designed and fitted with eight dial indicators used to measure the compressive and tensile strains designed to be comparable with those in service, and to record any permanent set, if any, when the load was released.

It is considered outside the scope of this Paper to give complete details of the machines used, but a broad conception of the procedure may be gathered by reference to Figs. 9 and 10, the former showing the machine designed by Joseph Booth & Bros., Union Crane Works, Leeds, the latter being a stress-strain diagram resulting from the application of a load of 62.5 tons.

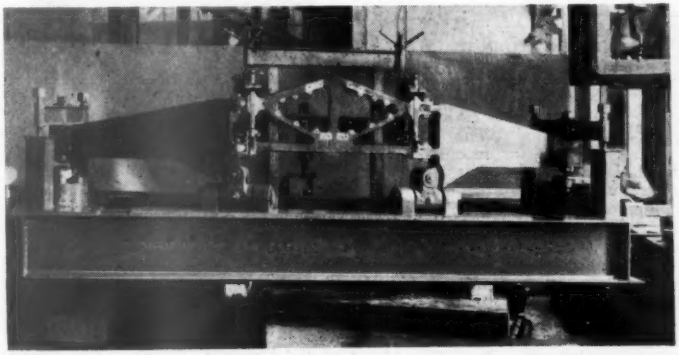


FIG. 9.—REAR SPAR UNDERGOING PROOF LOADING.

Clover-leaf Test-bar

Sufficient work has been carried out from tests machined from the clover-leaf test-bar[1] to establish its ascendancy over the horizontal keel block type of test-bar hitherto used. The design of this well-known type legislates for progressive solidification and, provided the feeder head is of adequate dimensions, the bar on horizontal sectioning will be found to be sound throughout its length. In the manufacture of aircraft castings in steel, test specimens machined from the clover-leaf bar are accepted as a routine indication of steel quality and heat-treatment, the castings themselves being accepted on Brinell values. The question of supplementary tests from castings has been referred to above (see Fig. 6).

D

Steel Castings for Aircraft

It is a usual condition that the heat-treatment of castings should be carried out with the appropriate test-bar, and it is obviously desirable that the section of the test-bar should, as far as possible, conform with the average section of the casting. It is therefore found in most cases advisable to cut up the cast bar longitudinally and to attach one or two wings to the casting during treatment.

Whilst the cast bar will be found to be sound throughout on sectioning, consideration of the mechanics of freezing has shown the presence of long primary dendrites with axes normal to the surface which often terminate in a mixed type of cellular crystals. Should the test-bar be machined from such a position, which incidentally is well within the wing, inferior values will result. The two features are illustrated in Fig. 11.

(To be continued.)

REFERENCES.

1 C. H. Kain and E. W. Dowson, "Design of Test Pieces for Carbon Steel Castings," Proc. I.B.F., Vol. XXXIII, p. 61.

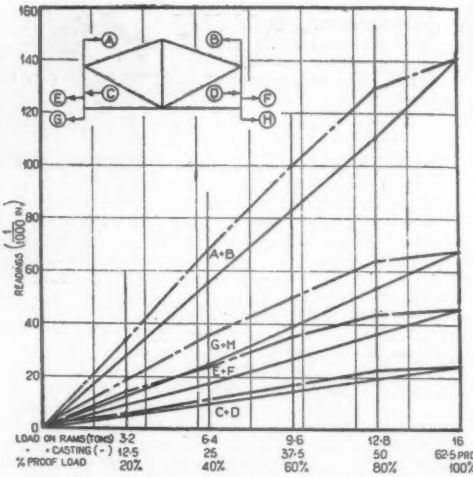
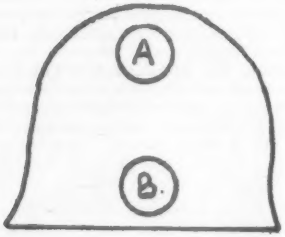


FIG. 10.—REAR SPAR—STRESS/STRAIN DIAGRAM RESULTING FROM LOAD OF 62½ TONS.



	Yield point, tons.	Max. stress, tons.	Elongation, per cent.	Reduction in Area per cent.
A.	58.1	61.6	18.0	48.3
B.	58.1	60.9	12.0	31.9

Izod (A), 64, 66, 65, ft. lb.
Izod (B), 36, 41, 32 ft. lb.

FIG. 11.—RESULTS OF TESTS TAKEN WITHIN THE WING OF CLOVER-LEAF TEST-BAR.

New Catalogues

Rainwater Goods. High Duty Alloys, Limited, of Slough, have just issued two catalogues covering a range of aluminium-alloy rainwater goods—pipes and fittings; half-round gutters and fittings and O.G. gutters and fittings. The two books are uniform in design and make-up, but not in size. The larger one covers the more technical aspects, by detailing the properties of the castings, by illustrating them and listing the range of sizes available and by outlining maintenance conditions. The smaller one is a price list and takes the form of a folder. Both are attractively carried out in yellow and black.

Nickel Alloy Steels.—An interesting publication by The Mond Nickel Company, Limited, was issued recently. It replaces a summary of the same title first published in 1931 as one of the series giving technical data on engineering materials. There have been reprints and revisions, but the many new alloy steels developed and their interesting applications call for a completely new edition. It briefly reviews the range of nickel alloy steels in the light of the effect of nickel and other alloying elements, and includes typical properties and applications of normalised, case-hardened, and fully heat-treated alloys. Copies of this publication are obtainable, free of charge, from The Mond Nickel Company, Limited, Grosvenor House, Park Lane, London, W.1.

A Moulding and Core-Sand Development

Use of Pitch-bonded Sand

By W. Bullock and J. Finlay

The question has often been asked amongst foundrymen, "What moulding materials and practice must be employed to enable the moulding material to fall cleanly away from the casting when it is knocked out of the mould?" The authors in this article reveal a new departure in core and moulding-sand practice which they have developed with outstanding results.

The full list of manufacturing problems, which foundrymen are continually making efforts to solve, is extensive, but the major questions to which a completely satisfactory answer has still to be found are: (1) The increasing cost of moulding materials, especially core oils; (2) The increasing cost of cleaning of castings; (3) The use of materials which release objectionable fumes; (4) The unsatisfactory surface finish on castings, especially on steel; (5) The tendency of some moulding and coremaking ingredients to cause skin irritation, and (6) The rising cost of fuels for mould drying and core baking.

The authors have made a full investigation into these problems in the foundry and, by trial and error in actual practice, have produced a mould and core-sand preparation which considerably reduces foundry costs and goes far towards supplying an answer to these problems. It is possible to produce a core sand mix, using an ingredient which replaces oil and which can be purchased at $\frac{1}{4}$ to $\frac{1}{6}$ of the present cost of most well-known core oils. The green cores can be dried at a very low temperature, much more rapidly than an oil-sand core. No baking of the sand mixture is necessary.

The same mixture can be used as a facing sand for both cast-iron and cast-steel castings. Castings moulded in this material can be knocked out of the mould entirely clean of sand, that is, there is no adhering sand or metal penetration into the sand. The most remarkable results in this respect are obtained with steel castings, and Fig. 1 indicates the high surface finish on castings made in this sand mixture. The photographs show castings just removed from the mould. The moulding materials fall away from the casting when it is shaken. Re-entrant angles are clear of sand and there is no evidence of scabbing or surface porosity. Cleaning and fettling is reduced to a minimum in most instances and sometimes no cleaning at all is required.

Throughout the investigations, the Authors avoided laboratory tests, except for occasional examinations under the microscope as the process developed. It was necessary to observe the development of any new problem in actual practice and to secure its elimination before complications became serious.

Modified Practice

It was important to prepare a sand mixture which could be used without difficulty by the core-maker. Earlier results with the use of pulverised pitch attracted attention and ultimately a core-sand composition which could be used successfully by the Authors, both "green" and when dried, was developed. No strength

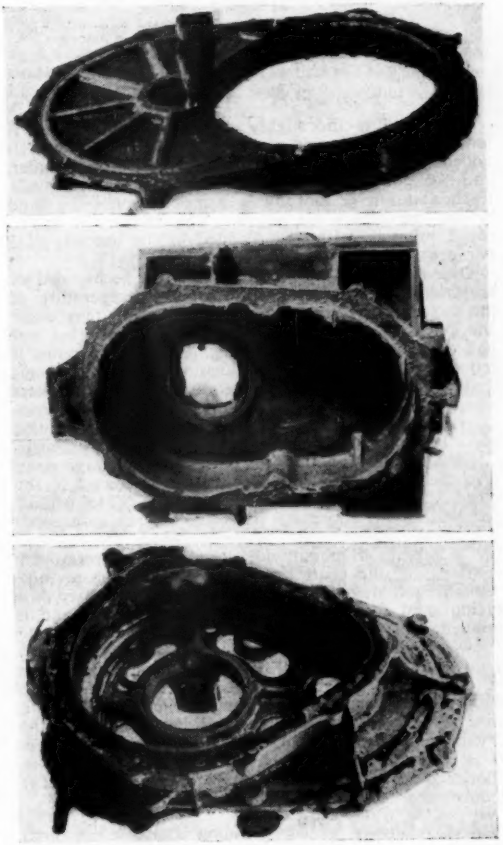


FIG. 1.—EXAMPLES OF STEEL CASTINGS MADE IN PITCH-BONDED SAND. NO CLEANING OR DRESSING HAS BEEN CARRIED OUT.

Moulding and Core-Sand Development

figures were calculated. The coremaker is not interested in figures, but is concerned with a sand which gives him the least amount of trouble. Likewise, the moulder who receives the dried core is only conscious of a core which he can handle and which gives him a good casting.

Considerable attention was given to producing cores which collapsed very readily after casting and this was successfully attained. The cores collapse completely and are fully disintegrated. The sand used is a washable silica sand, graded as in Table I.

TABLE I.—*B.S. Sieve Grading of Silica Sand.*

Retained on 30 mesh..	1.1	Retained on 100 mesh..	26.3
,, ,, 45 ,, ..	7.7	,, ,, 150 ,, ..	14.4
,, ,, 60 ,, ..	24.2	Passing through 150 mesh	0.8
,, ,, 72 ,, ..	24.4		

This sand is thoroughly dried and cooled, and is loaded into a mixer when it is cold. To the sand is added 0.5 per cent. clay, 1.5 per cent cereal binder, and 3.0 per cent. black powdered or pelleted pitch. Each addition is thoroughly mixed through the sand before the others are added. The mixture is milled for 5 minutes, with water added to the amount of 3 per cent.

Over-mixing of the composition must be avoided or the friction of the sand will raise the temperature of the mixture and give premature drying and may cause the pitch to liquefy. The cores are dried (but not baked) at 285 deg. F. (140 deg. C.), and 55 mins. is required from loading to unloading on a continuous drying stove for this. The cores have no hardness when unloaded from the stove but they harden considerably on cooling. They should not be handled until they are cold.

The core may or may not be coated, but large cores give the best results for steel or iron if coated in the green state with a creamy solution of "Molochite" and water with about 0.5 per cent. clay as a suspending agent. Large cores, however, which are required for a rapidly filling mould, need have no refractory coating, but the coating of any core may be to individual requirements. The same sand mixture is used as a facing sand for moulds in cast-iron and steel, and is applied over the pattern face to a depth of $\frac{1}{4}$ in. to $\frac{1}{2}$ in., the remainder of the mould being filled with sand of a coarser grading, bonded only with some form of clay. The surface of the mould is covered with the refactory wash as described earlier. The mould can be either skin- or stove-dried but control of the drying temperature at 285 deg. F. should be imposed. It is interesting to add that steel castings made with "knicked-down" risers, with an exothermic wall, further reduces the fettling time and costs.

Theory of the Bonding Practice

The powdered or pelleted black pitch added to the refractory sand becomes plastic around 80 to 100 deg. C. and during drying the pitch, becoming plastic, envelopes the fine sand grains. On cooling, the plastic pitch hardens and the core becomes a solid mass of sand and pitch. When a core or mould is coated with a refractory compound before drying, the refractory material is also enveloped in the solid pitch. When such a mould is cast, the high temperature volatilises the pitch, breaks down the bond and causes collapse of the core and mould facing. The collapse of the pitch bond is rapid but not before the casting has formed its first solid shell of metal against the sand. The refractory wash retards the premature collapse of the sand bond in a slowly-filling mould. The residue from the volatilised pitch, being ash, leaves the core and mould face highly permeable and it is not necessary to apply additional artificial vents.

It is interesting to note that this pitch-bonded sand requires considerable less venting than oil-bonded sand. It would appear from the foregoing description that, as the pitch volatilises, large volumes of smoke and fumes would be liberated into the atmosphere, but this does not happen. The hydro-carbons are absorbed in the mould and the gas which escapes from the mould (which may be methane) burns freely. The fumes entering the atmosphere of the moulding shop are thus considerably less than when oil sand is used. The surface, when the castings are removed from the moulding box and shaken, resembles a highly polished skin on which a thin film of carbon has been deposited.

Conclusion

The economies effected by using this pitch-bonded sand are considerable. The sand itself is produced at greatly reduced cost, and the processing of the castings afterwards is greatly curtailed. The foundry is then in a position to market castings with a superior surface finish. This is particularly important with steel castings which are subject to machining, there is no surface (or under-the-surface) sand to interfere with machining.

The use of the mixture in the Foundry promotes more pleasant conditions. In practice, scabbing and blowholes are greatly reduced. Further developments with pitch are contemplated. The Authors are indebted to the Directors of Cruikshank and Company, Limited, Denny Iron Works, Denny, for permission to publish this report and for their help and encouragement in carrying out these investigations.

Long-Service Awards

Four employees of Smith Bros. & Company (Hyson), Limited, brassfounders, of Nottingham, who have completed more than 50 years' service with the firm, were presented with a long-service certificate, together with a cheque, in recognition of their work for the company. Seven other workers with between 40 and 49 years' service also received cheques and certificates. One of the recipients, Frederick Gibbs, an estimator, has completed 56 years' continuous service and claims he has never been late for work. His father before him completed 45 years' continuous service; a brother was employed for 30 years and a brother-in-law for 20 years. The presentations were made by Alderman George Clark, managing director of the company.

Institute Elects New Members

(*Continued from page* 464.)

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* Transferred.

As Associates (over 21)

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As Associates (under 21)

P. Banks, laboratory assistant, Blackstone & Company, Limited, Stamford; D. C. Welch, student, Loughborough College.

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Salford; F. Roberts, moulder, Harding Castings, Limited, Warrington; P. W. Ryder, assistant to foundry manager, Ryder Bros., Limited, Bolton; W. I. Shaw, moulder, Tweedale & Smalley (1920), Limited, Rochdale; R. Taylor, journeyman patternmaker, Petrie & McNaught, Limited, Rochdale; W. S. Towell, foundry clerk, Austin Hopkinson & Company, Limited, Audenshaw; R. L. Vincent, superintendent, Gresham & Craven, Limited, Salford; R. Forbes Baird, director and secretary of Ironfounders' Associations.

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E. C. Davies, patternmaker, Richard Thomas & Baldwins, Limited, Pontypool; L. Elijah, B.Sc., student, National Foundry College; K. G. Reeve, clerk, Thos. S. Smeeth, Bradford; R. P. Shaw, foundry apprentice, Blakeborough & Sons, Limited, Brighouse.

*Transferred.

Making a 5-ton Ingot Mould.

Mr. J. Steele, the Author of this Paper (printed in our issue of October 28), sends the following correction. The second paragraph, page 415, column 2, should begin: "The sand used for the mould body is mixed in an August-Simpson reclamation plant."

Book Reviews

"Asbestos, Its Preparation and Application," by A. E. Williams, F.C.S. Published by Emmott & Company, Limited, 31, King Street West, Manchester, 3. Price 2s. 6d. net.

Though there may be a considerable literature on the subject of asbestos, this is the first one the reviewer has so far encountered and, as a survey of the subject, he is satisfied that it is adequate for the purpose for which it is written. As, in recent years, this material has entered into foundry practice, its users may like to know more about its origin and properties. If this be so, here, indeed, is an excellent and inexpensive source.

The Story of Iron. By J. B. Fortune, M.Sc., and Paul B. Mann. Published by Penguin Books, Limited, Bath Road, West Drayton, Middlesex. Price 1s. 6d.

It can be presumed that the publishers in sending along this book for review had in mind the acquisition of an opinion as to its technical accuracy rather than its literary merit. If this be so, then an unqualified assurance can be given that there are no mis-statements. In giving the working temperature, even though it be related to boiling water, the reviewer believes the insertion of an F. is desirable. For technical fathers of families who have children interested in parental activities this book will save much sketching on the backs of envelopes and hours of talk. Written in truly simple language, and both clearly and artistically illustrated, "The Story of Iron" can be unreservedly recommended to the layman desiring to understand just what is pig-iron.

V. C. F.

Development and Compensation. A Guide to the Town & Country Planning Act, 1947. By W. J. Luxton, Barrister-at-Law. Published by the Association of British Chambers of Commerce, 14, Queen Anne's Gate, London, S.W.1. Price 4s.

This is a most readable book, understandable by the common or garden person, with little legal jargon. It really gives a comprehensive survey of this important Act. It explains in simple form practically everything in the Act, knowledge of which might be required alike by individuals and firms, and the matters dealt with can be easily found through the very excellent index. There are ten chapters with four appendices and in the last named will be found lists of various Orders which will apply to specific matters, with addresses of different offices of the Ministry of Town and Country Planning, the Central Land Board, Regional Offices, and the like. In Chapter X, entitled "Comments on Particular Points," pertinent points of the measure are commented upon, so one receives an excellent conclusion of the work

Claims for compensation (there is a £300 million fund for this purpose) must be made within certain time limits, and in Chapter VII useful information is given as to how claims can be made and within what time; incidentally claims can be made between July 1, 1948, and March 31, 1949, but the Central Land Board can extend this period to June 30, 1949, on good cause being shown for the delay in making a claim. F.J.T.

Institute of British Foundrymen *London Conference Discussion*

Plastic Flow in Cast Iron*

By C. R. Tottle, B.Met., A.I.M.†

DISCUSSION

Mr. Tottle having briefly introduced his Paper, THE CHAIRMAN (Mr. R. B. Templeton), opening the discussion, said his comment on the Paper was that the method of testing adopted by the Author was simple but most effective. The theory of the mechanism of deformation was most lucid, and although he believed it was not generally accepted, he agreed with the suggestion that in grey iron some plastic flow resulted from any stress applied. One of the striking results was the increase of almost 30 per cent. in the plastic flow with very slow increments of stress.

Perhaps that Paper would finally remove the myth of "weathering" of castings which was still widely practised, and it did give guidance for the stress relief of commercial castings. It was not until 600 deg. C. that the curve was flat so that the maximum relief was obtained without excessive time. He could certainly confirm that castings so treated did not subsequently distort.

MR. M. M. HALLETT (Sheffield) said Fig. 1 did not make quite clear the contact between the stirrup and the test-bars. Was there a roller under the flat strip so as to give a line contact on the bars, or was the contact over the full width of the strip? It would influence the distribution of stresses about the centre point. He would like to draw attention to the advantages of ring test-pieces in work of that type, since they offered many advantages and were very simple.

He enquired how long the specimens were subjected to the preliminary heat to 700 deg. C., since even a short time led to incipient spheroidisation of the pearlite. He wondered if the phosphorus contents in Table I were correctly quoted. The variation in the properties of the irons was less than would have been expected.

Plastic Flow at Room Temperature

Another point which seemed to him rather curious was the comparatively low value for percentage plastic strain on normal loading at room temperature. Mr. Tottle quoted a figure of about 10 per cent., but from piston ring test-pieces he had found variations in plastic strain ranging from about 12 per cent. for a hard brittle type of phosphoric iron to as much as 40 per cent. for a soft iron, all appreciably higher than Mr. Tottle. He suggested that might be due to the method of stressing.

The increase in percentage plastic strain resulting from incremental stressing was surprisingly high. Comparing two bars, one stressed normally and the other by increments to nearly the same total deflection, the percentage plastic strain was much greater in the latter. In the test-bar with a high plastic strain there must have been less elastic strain, which must, he thought, be associated with a decrease in stress. The Author was doing something like the Barr-Bardgett creep test.

It had long been known that cast iron was deformed to a limited extent at room temperatures, but it was surprising to find so much plastic strain as was now reported; the Author concluded that that was creep behaviour. The literature on the creep of cast iron was very meagre, but looking at the sort of values there were available, a temperature of at least 370 deg. C. was required to produce a steady creep rate of only 2 to 3 $\times$ 10^{-7} in./in./hr. at a load of 10 tons per sq. in. with engineering grey iron and it appeared that at room temperature the creep rates would be infinitesimal.

Behaviour of Ring Specimens

Nevertheless, he could confirm Mr. Tottle to some extent. He had been studying the behaviour of piston ring irons of various types at elevated temperatures between 200 and 300 deg. C., loading for various times up to 30 days. At 300 deg. C. much plastic strain took place and the curves followed the same type of curve as Mr. Tottle's. At 250 deg. there was still some plastic strain, but it was much less at 200 deg. C. The rates were very low indeed and the general inference was that they would be virtually nil at room temperature. Was Mr. Tottle justified in referring to his plastic extension as creep? Only the provision of full and accurate creep data would show and he thought everyone would welcome the data that Mr. Tottle indicated he would be publishing, for it would help to fill a wide open gap in the literature of cast iron.

MR. TOTTLE said with regard to the contact between the stirrup and the bar there were, at the centre of the stirrup plates, distance pieces between the bars which ran the width of the bars and the same width of the stirrup applied on the top. It actually covered the same part of the web. As far as ring test-pieces were concerned they were now using ring test-pieces and he agreed it was easier than the method quoted in the Paper.

In the preliminary heating for test at 700 deg. C. they had to make many tests before they found exactly how long they could leave it at 700 deg. C., and in the end it was approximately ten minutes and he felt it was sufficient to ensure that there would be left in bars very little stress which was produced by the original casting.

*Abridged title of a Paper presented at the London Conference of the Institute of British Foundrymen, and published in the JOURNAL, November 11, 1948.

†Lecturer in Metallurgy, University of Durham, King's College, Newcastle-upon-Tyne.

Plastic Flow in Cast Iron—Discussion

In Table I the phosphorus contents were perfectly true. The 1 per cent. surprised him as much as it did Mr. Hallett. As to initial loading, he had looked at the results mentioned which gave plastic strains on loading of anything from 20 to 30 per cent. The figures quoted in that Paper were obtained by something similar to the methods he had been using. Time had a little effect, although perhaps very small, but he could not give any information as to why he had such low plastic strains on loading, but they were all 10 per cent. or less and he still thought the whole phenomenon was a creep effect.

Nature of Incremental Stressing

In the incremental stressing, as Mr. Hallett pointed out, a large amount of plastic flow must decrease the stress on the bars so that they were subject to lower stress, but subject to that error, in that it was only an extra on the original values, then it was an equally accurate test. He had tried a test of that kind on a creep machine at room temperature and the results followed almost exactly those by transverse bending. He admitted with the values which room temperature gave, one would not expect the plastic load to increase as it did, but he would point out that in general they were very small, especially when the stress was very small.

The amount of creep taking place with the increase of plastic strain was only about 0.5 per cent. The increase was small. It might be that it was only when they reached the high stress regions that the factor was really significant, yet it was found in that way.

[At this point in the proceedings the Chairman handed over his office to Mr. A. E. Peace.]

DR. EVEREST said he was sorry to see that Mr. Templeton was leaving because he had hoped to cross swords with him about his opening remarks. The Paper in his opinion showed there was some justification for the weathering of iron castings, but he had understood that Mr. Templeton took the opposite view.

He thought the Paper extremely interesting and valuable. The Institute had already produced one Report on the stress-relief treatment of iron castings, but the work was by no means finished and already questions had arisen which made it necessary for them to study further the whole evidence of the incidence of stress in castings. There was another committee dealing with the effects of stripping temperature on iron castings, in which the development of internal stresses played a vital part. He made a strong recommendation to the Chairman that they might forthwith co-opt Mr. Tottle on to their committees to get the benefit of his work and views.

There were one or two points on which he was not clear. He gathered that as plastic flow took place in the ring used in the tests, so the applied stress was automatically reduced. He asked Mr. Tottle if he contemplated any general work run on a creep basis in which the tests were repeated, but the stress was maintained? He thought that such tests would come very near being creep tests, and might lead to very interesting results.

He, like other speakers, felt critical of the set-up shown in Fig. 1, and in particular with regard to the shape of the spacing pieces, but no doubt further development would enable this design question to be cleared up.

Other points he had in mind had been largely covered, but he suggested that Fig. 3 was a little misleading. If they read the caption carefully they would note that the stress applied was 90 per cent. of the transverse rupture stress. Then there was a diagram showing four curves. It was not immediately obvious that actually the stress applied in each case must be different because all those irons had different strengths and the spacing shown would be determined by the different loads applied to the different bars.

Weathering for Stress-Relief

He would congratulate the Author and say that in his view the Paper did show some justification for the treatment of castings by weathering. He had never felt happy about the conclusion reached by TS17 that there was no relief of stress until elevated temperatures were reached. He had felt all along there was some evidence of release of stress even at room temperature. It was obvious from experience that in certain castings internal stresses might be concentrated at certain points and if the casting did not break it was likely that such stresses might be nearly 90 per cent. of the tensile strength of the metal. If such a casting were put out, in the weather for some months it became perfectly safe. It was because part of the stresses, the dangerous part, redistributed themselves by plastic flow.

MR. TOTTLE, answering Dr. Everest, agreed that the work did show that there was some flow taking place at low temperatures, but he would ask, why put the casting outside? With many of the specimens he had taken, the difference between inside and outside was nil. The only thing was, one had more rust on those left outside the laboratory. He believed engineers liked to see a modicum of rust, but there seemed to be no valid reason to put the casting outside. Many foundrymen had told him that it was inadvisable to machine castings for a year at least, but the present work showed that high stresses, at least, were removed in two months, so a year would seem to be more than adequate.

In regard to keeping the stress level constant and not allowing it to decrease, he thought it might be useful, but it did not tie up with the stress level effect. From a theoretical point of view, he thought it would be very interesting, but the incremental stressing method was by small increases. Each little point shown on the graph was part of a creep curve in itself, although he had not shown it, and while one could increase stress by another 10 per cent., it did not represent a true 10 per cent. increase.

He acknowledged the objection to Fig. 1 and the specimens between the bars. Unfortunately, that photograph was taken a long time ago and that old set-up had

been abandoned quite rightly, and substituted by cylindrical distance pieces mentioned in the caption. That one was not actually used, because it did give a peculiar line contact between the bars.

In Fig. 3, although each iron was stressed to 90 per cent. transverse rupture stress, the load corresponding to that was quite different and he quite agreed it was misleading. He had not noticed it and was grateful for having it brought to his attention.

Stress-relief by Heat-treatment

MR. P. A. RUSSELL stated that the Paper marked a further advance in the study of a problem that had been before the Institute several times in recent years. The work was carried on by more scientific methods than he had employed in his own investigation and proved that stresses could be relieved, to some extent, by ageing alone. He still contended that stress relief by heat-treatment was the most certain method and gave much greater relief of stress if the temperature were sufficiently high. For example, the Author's Fig. 3 gave plastic strain increasing from 6 to 10 per cent. to 10 to 18 per cent., whereas his Fig. 7 showed increases up to 80 per cent.

He regretted that the Author had confined himself to studying high-duty irons, particularly as the relief of stress appeared to be the greater, the higher the initial tensile strength. He reminded the Author that the industry as a whole was far more concerned in the production and use of castings that did not come within the high-duty class.

MR. TOTTLE said he quite agreed with Mr. Russell. He thought heat-treatment was the safest way. The fact that he had not used any irons of 10 tons per sq. in. was perhaps an unfortunate omission. That should be corrected, and also corrected for not only room temperature, but higher temperatures also.

MR. H. G. HALL said that as Mr. Hallett and Dr. Everest had covered most of his points he had little to say, but he still could not accept Mr. Tottle's statement that the ten minutes' treatment at 700 deg. C. resulted in no change of microstructure or hardness.

MR. TOTTLE said he was sorry he could not produce the micro-section, or a slide showing it, but sections were taken along the whole bar after that treatment and in no case was any such change noticed up to 1,000 diameters magnification.

Surface Stresses

MR. H. J. YOUNG (member) said that ageing of castings was probably more effective out of doors than indoors by reason of rust-attack upon the skin; in this connection he had observed that certain individually-cast piston rings were "born" with a remarkable stress in them, which was removed completely by machining the upper and lower surfaces of the ring. He shared the opinion that research work of this nature would have wider application if performed upon cast iron of normal carbon and sulphur contents, with a phosphorus percentage between 0.25 and 0.75 per cent. and containing no alloy. The great majority of ironfoundries could not accept a substantial order for large, intricate and valuable castings if the condition were that they would be ruthlessly rejected when the 1.2-inch test-bar, poured in the presence of an inspector from the same ladle as each of the castings, failed to give a minimum of 20 tons per sq. in. tensile; while those who could cater for a similar contract on a 23-ton minimum would be few indeed. If Mr. Tottle required bars of commercial quality grey cast iron in order to carry on this interesting research work, he (Mr. Young) would be glad to supply them at any time.

MR. TOTTLE said he agreed that in certain cases that was possibly true, but in cases of that work if they managed to use as-cast bars, on all surfaces, and get good results they would be very valuable, but it would be advisable to find a method in which they could make a check to show if the skin had an effect. He agreed weathering would remove some of those effects, and perhaps weathering outside would be preferable.

THE CHAIRMAN thanked Mr. Tottle for a most interesting Paper, and an unusual one, which had stimulated an excellent discussion.

Publication Received

Notes on Soldering. Published by the Tin Research Institute, Fraser Road, Greenford, Middlesex.

During recent years every detail of the soldering process has been scientifically investigated and a considerable literature on the subject has accumulated. In a new edition of the Tin Research Institute's handbook "Notes on Soldering," W. R. Lewis, B.Sc., reviews these researches and presents a compilation of the more important facts which are likely to be of value to solder users in a large variety of industries. Advances in soldering technique, with particular reference to mass-production methods of assembly, are discussed, and the various forms of solder and methods of applying heat to the joints are described in outline so that their principles may be easily discerned and readily adapted for any particular applications. The importance of design for soldering is emphasised The fundamental principles underlying the production of "wiped joints" in lead pipes are fully covered and alternative types of joint in lead pipe are described and illustrated. Aluminium, stainless steel, cast iron and other "difficult-to-solder" alloys are capable of being soldered by the special methods suggested.

The behaviour of solders at various temperatures, under tensile and shear stresses, and under creep conditions is important to the designer and to the production engineer, and data on these properties, together with notes on the metallurgical constitution of the tin-lead solders, are included. "Notes on Soldering" also contains an adequate bibliography and a detailed scheme for the chemical analysis of tin-lead solders devised by Dr. J. W. Price. This 88-page booklet, which is well illustrated, is available, free of charge, on application to the Tin Research Institute. Readers in the United States of America are requested to apply to Dr. Bruce Gonser, The Battelle Memorial Institute, 505, King Avenue, Columbus, 1, Ohio, U.S.A.

Government's Steel Policy

Federation President Attacks Bill

Sir Ellis Hunter, president of the British Iron and Steel Federation, issued a statement on November 11—publication being simultaneous with the announcement of steel output in October being at a record rate—in which he declared that "the whole structure of the Iron and Steel Bill is such as to create controversy and conflict between the State and private enterprise over a wide area of industry without the slightest indication being given of the terms or principles on which public money and public powers would be used in the conflict."

He stressed that the Government's nationalisation policy would be grievously prejudicial not only to iron and steel output and development, but also to the industries which iron and steel served.

"Maximum production from the steel industry is now and for the immediate future the vital need of the nation," said Sir Ellis Hunter. "The co-ordinated effort of the individual firms in the industry, under public supervision of policy, has resulted in record levels of output and in the steel-using industries being enabled to play a dominant role in expanding exports. Over the longer term, progressive development of the steel industry is equally vital. In this respect the industry's development plan (already approved by the Government) is now well under way and beginning to yield results.

Government Supervision

"The Government has, through the Iron and Steel Board, been the public supervisor of the present wide range of industries covered by the term 'iron and steel,' which includes not only iron ore, pig-iron, steel ingots and hot-rolled products, but also forgings, castings, cold-rolled products, wire, tubes, tyres and axles, bolts and nuts, and many other forms of iron and steel. In this way the Government has controlled development and prices and other aspects of current activity which it has thought necessary to bring under public supervision.

"Under the Bill the Government is proposing to abdicate from its impartial position. By taking 107 firms into State ownership (selected from over 2,000 firms supervised by the Iron and Steel Board) the Government would become in a great variety of industrial activities, even within the iron and steel industry, a competitor with private firms. At present the State sees that a fair position is maintained between firms. In future the Government would, itself, be an interested party controlling the price and volume of the raw material supplies of its competitors in the finishing branches.

"As owner of the 107 firms they would similarly become competitors in many British industries beyond the bounds of iron and steel products—for example, bridge-building, structural and many other forms of engineering and machine-tool making—and in many branches of industrial activity in the Commonwealth and abroad.

"All the efforts made over a period of years to develop an enlightened co-operative approach by the iron and steel industry in its relations with the State will go for nothing.

"The industry has always been prepared for further constructive development of public co-operation, but the Government have abandoned their own experiment of control through the Iron and Steel Board, in favour of a policy grievously prejudicial not only to iron and steel output and development, but also to the industries which iron and steel serve."

Steel Bill and Engineering

"Disastrous Effect" of New Measure

The Engineering Industries Association states that it views the proposed measure to nationalise the iron and steel industry as one which will inevitably have a disastrous effect upon the engineering industry. An atmosphere of uncertainty in which forward planning—an integral part of engineering—becomes almost impossible, will be created, and that atmosphere will last for more than a year and a half.

"It is to be deplored that such a state of affairs should be brought about at a time when our very existence as a nation is dependent upon the productive efficiency of the engineering industry," the statement goes on. It points out that many of the Association's members, under the provisions of the Bill, will have to buy their raw materials from State-owned concerns, and then asks: "How can they view with equanimity a position in which their supplies of raw materials will be controlled by their competitors? If this Bill reaches the Statute Book, private firms will have to compete against those firms owned by the Iron and Steel Corporation and backed by the whole weight of the Government. Will the Government be likely to give a firm operating under private enterprise the same facilities as their own?—surely there exists the danger of preferential treatment."

Contracts Open

The dates given are the latest on which tenders will be accepted. The addresses are those from which forms of tender may be obtained. Details of tenders with the reference E.P.D. can be obtained from the Export Promotion Department, Board of Trade, Thames House North, Millbank, London, S.W.1.

Belfast, November 25—Supply of steel tubular traction poles, tramcar steel tyres, etc., for the Town Council. The General Manager and Engineer, Transport Department, Sandy Row, Belfast.

Carmarthen, November 26—Supplying and laying about 250 yds. of 6 in. dia. and 4,450 yds. of 4 in. dia. spun-iron water mains, for the Rural District Council. Mr. G. G. Thomas, engineer, 3, Spilman Street, Carmarthen. (Deposit £3 3s.)

Manchester, November 27—Supply of hydraulic pipes and special castings, for the Corporation. The Secretary, Waterworks Offices, Town Hall, Manchester, 2.

Structure of the Steel Industry

Co-ordination, but Competition Retained

The capital investment in many industries is now so large, and the importance of overcoming extreme trade fluctuations is so great, that there is inevitably a direct public interest in industry which, in the conditions prevailing to-day, may not be fully safeguarded by private competition alone. This is recognised by the iron and steel industry and the point is discussed in an article in the latest edition of the "Statistical Bulletin" of the British Iron and Steel Federation.

The "Bulletin" says that there is clearly competition in iron and steel, when the industry is looked at broadly, through its being a highly competitive export industry—as much as 30 per cent. of its output going either directly or indirectly into exports. Further, steel is competitive with many other products—timber, glass, aluminium, plastics, etc. Perhaps, however, of greater significance is the competition within the industry in the sense that each of the many independent firms is a separate commercial entity and has the normal incentive to do well by its workers and its shareholders.

Price Question

The issue of whether or not there is true internal competition depends upon whether the natural competition between firms is overlaid by monopolistic practices. The simplest definition of monopolistic action in this connection, and the one in fact used or implied by critics of the industry, is that the firms concert together to fix the price of steel, or, as it is sometimes put, to restrict the supply so that the price is forced up. Certainly this influencing of prices by collective action goes to the heart of the difference between conditions under which prices are fixed by competitive forces in the market external to the particular firm and conditions of monopoly, where firms prevent these forces working and themselves determine the price by collective action.

In fact, in the case of steel, the price is also externally determined, since it is not fixed by the firms themselves, but by the Government under Statutory Order. This entirely prevents collective action being taken to raise the price and leaves each firm, as in fully competitive conditions, to work against a price established by external factors. The whole interest of the firm is to lower its costs and to do the best it can in relation to this externally determined price.

An Important Difference

There is, however, one important difference, adds the "Bulletin," between the establishment of steel prices by a public authority and their determination by a free competitive market—namely, that the control method will normally aim at greater stability. In general, in a competitive market any short-term excess of demand over supply forces up prices to a level which may ultimately equate demand and supply, and in times of excess supply, the price is forced down again towards a point of equilibrium. It by no means follows that the resulting violent price fluctuations are in the public interest; and Governments are increasingly interfering with this competitive adjustment on the grounds that the degree of price fluctuation is too severe and that it is not certain whether, in fact, short-term equilibrium can be established at any level short of complete dislocation through a runaway inflation or deflation.

In official price fixing, therefore, the purpose is generally to pursue a policy which has regard to the long-term cost position of the industry, rather than one based on the short-term position. In such circumstances it is of crucial importance that the price should at any rate provide an adequate return on capital being currently invested in the industry, either for modernisation or expansion.

One aspect of the competition between firms is the very considerable changes in relative output between companies. Over 10 years—between 1938 and 1948—some concerns have expanded ingot production by as much as 80 per cent., whereas there are other cases where plant and other difficulties have prevented any appreciable expansion. There is no quota or other limit set on the expansion of firms, and that the results have in fact turned out very differently from one company to another is indicated by the table published in the "Bulletin." This shows the percentage increase or decrease in steel production of 24 firms over the last decade. One firm returned a decrease of 9.6 per cent.; the 23 others show increases ranging from 3.8 per cent. up to 82.7 per cent. All other firms together show an increase of 65.9 per cent., the percentage increase for the whole of the United Kingdom being given at 45.5 per cent.

In addition to the pressure of competition as between individual firms, there is another vital factor which cannot be excluded in any appraisal of modern industry—that is, the extent to which the activities of the separate firms may, with advantage, be consciously co-ordinated in relation to the public interest. This co-ordination has two aspects—first, co-ordination between firms in the industry, and, secondly, the co-ordination of the policy of that industry in relation to a conscious expression of the national interest.

A Framework of Knowledge

In regard to co-ordination between firms, the vital new element introduced here is the increasing recognition that the decisions of individual firms can, with advantage, be taken within a framework of knowledge and not as a result of what is very often almost a blind assessment of the position taken (when the units in industry were smaller) on a trial and error basis.

The primary function of the Iron and Steel Federation, which is the central organisation on the management side of the steel industry, has therefore been to provide a body of knowledge regarding the industry as a whole which would be valuable to all the constituent firms, as well as to the community at large. Beyond the provision of greater knowledge, so that competition ceases to work in the dark, the Federation has also been concerned to ensure the provision of co-operative service in any field where the efforts of individual firms can be assisted by advice or collective action of a constructive character.

Iron and Steel Distribution Scheme

Notes for Consumers

The iron and steel distribution scheme, first introduced in 1940, has recently been revised and the circular headed "To all Users of Iron and Steel" issued in January, 1948, gave detailed instructions to consumers about the changes in the scheme and the transitional arrangements connected with the replacement, for steel other than sheets, of Form M by the I.S. Authorisation. A publication under the title of "Notes for Consumers," now issued by H.M. Stationery Office (price 6d.) contains information in four appendices intended as guidance to consumers on the operation of the revised scheme.

Appendix I is a list of the controlled forms of iron and steel to which the distribution scheme applies. Appendix II gives the names and addresses of the departments responsible for authorising iron and steel under the scheme, with the purposes sponsored by each. Appendix III contains lists showing (*a*) small quantity exemptions; *i.e.*, the quantities and values up to which certain forms of iron and steel covered by the distribution scheme may be acquired without authorisation against a certificate by the purchaser, and (*b*) controlled forms of iron and steel not subject to distribution control, which may be acquired without authorisation. Appendix IV is a list of the main finished products, components, etc., for which direct authorisations of iron or steel are made by, or on behalf of, departments to the producers and for which, therefore, it is unnecessary for the purchaser to furnish a sub-authorisation for iron or steel to his supplier.

New Companies

("Limited" is understood. Figures indicate capital. Names are of directors unless otherwise stated. Information compiled by Jordan & Sons, 116, Chancery Lane, London, W.C.2.)

North Eastern Iron Refining Company—To acquire part of the business and undertaking of the North Eastern Iron Refining Company (in liquidation) and to carry on business of iron and other metal refiners, etc. £10,000. P. Kirk, 7, The Green, Houghton-le-Skerne, Darlington.

Istelco, Waverley Works, Effingham Road, Sheffield—To take over the business of manufacturers of iron, steel and other metals carried on at Ivanhoe Works, Meadow Hall, Sheffield, by Henry Rossell & Company. £75,000. F. W., K., H., and W. E. Shenstone, and P. Gill.

Dunston Iron Company, 17, Throgmorton Avenue, London, E.C.2—To obtain an option to acquire the blast furnaces, ironstone mines and properties, rolling mills and all other assets of the business of ironmasters, ironfounders and rollers of and workers in iron and steel now carried on by the Sheepbridge Coal & Iron Company. £10,000. Rt. Hon. Lord Aberconway, G. Nicholson, G. C. M. Jackson, T. E. Haslam, Lt.-Col. J. Leslie, F. W. Stokes, L. C. Hodges, N. M. Peech and A. V. Nicolle.

Steel Output Record

Pig-iron Production Higher

Steel production last month was at a new record annual rate of 15,455,000 tons, compared with a rate of 15,435,000 tons in September and 14,316,000 tons in October of last year. The previous record rate was 15,440,000 tons, which was attained last June. Steel output is thus still running well above the Government's revised target of 14,500,000 tons for 1948.

There was also an increase in pig-iron production last month. Output in October was at an annual rate of 9,525,000 tons, compared with 9,407,000 tons in September and 8,352,000 tons a year ago.

Latest output figures compare as follow with earlier returns:—

	Pig-iron.		Steel ingots and castings.	
	Weekly average.	Annual rate.	Weekly average.	Annual rate.
	Tons.	Tons.	Tons.	Tons.
1948—1st qtr. ..	174,700	9,084,000	287,200	14,933,000
2nd qtr. ..	182,000	9,464,000	294,700	15,325,000
3rd qtr. ..	175,800	9,143,000	269,200	13,998,000
October ..	183,200	9,525,000	297,200	15,455,000
1947—1st qtr. ..	134,400	6,990,000	216,000	11,232,000
2nd qtr. ..	141,600	7,362,000	244,100	12,694,000
3rd qtr. ..	146,700	7,626,000	235,400	12,240,000
October ..	160,600	8,352,000	275,300	14,316,000

Beilby Memorial Awards

From the interest derived from the invested capital of the Sir George Beilby Memorial Fund, at intervals to be determined by the administrators representing the Royal Institute of Chemistry, the Society of Chemical Industry, and the Institute of Metals, awards are made to British investigators in science to mark appreciation of records of distinguished work. Preference is given to investigations relating to the special interests of Sir George Beilby, including problems connected with fuel economy, chemical engineering and metallurgy, and awards are made, not on the result of any competition, but in recognition of continuous work of exceptional merit, bearing evidence of distinct advancement in science and practice.

In general, awards are not applicable to workers of established repute, but are granted as an encouragement to younger men who have done original independent work of exceptional merit over a period of years. Consideration will be given to the making of an award or awards from the fund early in 1949, and the administrators—the presidents, honorary treasurers and secretaries of the three participating institutions—will be glad to have their attention drawn to outstanding work of the nature indicated, not later than December 31, 1948. All communications on this subject should be addressed to the Convener, Sir George Beilby Memorial Fund, Royal Institute of Chemistry, 30, Russell Square, London, W.C.1.

Company News

(Figures for previous year in brackets.)

Burco—Dividend of 35% (same).

R. & J. Dick—Dividend of 25% (same).

Inbucon—Interim dividend of 2% (same).

Minimax—Interim dividend of 8% (same).

Drake & Gorham—Dividend of 5% (same).

Dowding & Mills—Dividend of 100% (same).

Thomas Harrington—Dividend of 45% (same).

D. Sebel & Company—Interim dividend of 16⅔%.

Thos. Goldsworthy & Sons—Dividend of 7% (nil).

Round Oak Steel Works—Dividend of 8% (same).

E. W. Tarry & Company—Dividend of 15% (same).

Stream-Line Filters—Interim dividend of 5% (same).

Fuller's Earth Union—Interim dividend of 4% (same).

N. Greening & Sons—Interim dividend of 5% (same).

Guest, Keen & Nettlefolds—Interim dividend of 4% (same).

William Baird & Company—Interim dividend of 4% (same).

Carrier Engineering Company—Dividend of 35% (same).

Richard Johnson & Nephew—Interim dividend of 5% (same).

Deritend Stamping Company—Interim dividend of 5% (same).

Crabtree Electrical Industries—Second interim dividend of 5%.

Hale & Hale (Tipton)—Final dividend of 15%, making 20% (same).

Garrard Engineering & Manufacturing Company—Interim dividend of 12½% (same).

Wallis Tin Stamping Company—Final dividend of 33⅓% (same), making 66⅔% (40⅝%).

Herbert Morris—Final dividend of 15% and bonus of 2%, making 22%, tax free (same).

Atlas Steel Foundry & Engineering Company—Final dividend of 27½%, making 42½% (same).

Zinc Corporation—Interim dividend of 25% (same) on the 10s. shares and of 12½% (same) on the £1 stock units.

B. & S. Massey—Interim dividend of 7½%. In the past two years the company paid 17½% annually in single payments.

Sadler & Company—Net balance to June 30, after depreciation, tax, etc., £4,376; dividend of 5% (same); forward, £4,670 (£4,245).

Crittall-Hope Metal Windows (South Africa)—Interim dividend of 10% actual, subject to non-resident shareholders' tax of 7½%. (For the previous year 25% was distributed in one payment.)

Willowbrook—Consolidated trading profit to July 31, £46,172; to directors' fees, £900; directors' salaries and commission, £5,773; auditors' fees, £482; depreciation, £2,533; leaving £36,484; brought in, £10,696; to tax, £12,399; reserve for future tax, £12,357; dividend to parent company, £7,944; forward, £14,479.

Shotts Iron Company—Balance at credit of profit and loss account to September 30, after crediting £4,454 for non-recurring trading receipts and providing for taxation of £23,018, £20,719 (£124,068, which included £50,000 taxation provision no longer required); dividend of 5% (same); forward, £158,353 (£155,761).

A. Kershaw & Sons—Consolidated revenue in 1947, £94,469; to bank interest, £11,773; depreciation, £12,164; audit fee, £846; net profit, subject to tax, £69,686; brought in, £37,701; excess tax provision, £597; to tax, £34,357; attributable to outside shareholders, £9,331; preference dividend, £17,542; forward, £46,754.

Betts & Company—Net profit to June 30, after taxation, depreciation, etc., £60,343 (£30,498), to general reserve, nil (£6,254); reserve for possible future depreciation of stock values, £20,000 (nil); staff superannuation fund, £16,000 (nil); final dividend of 10% (7½% and bonus of 5%), making 15% (same); forward, £18.675 (£10,832).

Richard Johnson, Clapham & Morris—Net profit for the year ended June 30, subject to taxation, £75,832 (£86,424); to tax, £35,109 (£47,000); final dividend of 15% and bonus of 10%, making 30% (same); participating dividend on preference shares of 4%, making 10% (same); to general reserve, £20,000 (same); forward, £8,714 (£6,959).

York Steel Flax Spinning—Profit for the year ended June 30, £296,747 (£250,571); to depreciation, £20,000 (same); debenture interest, £11,250 (same); directors' fees, £400 (same); tax, £140,000 (£129,000); net profit, £125,097 (£89,921); to general reserve, £40,000 (£60,000); stock depreciation reserve, £55,000 (nil); final dividend of 5%, making 8% (same); forward £53,336 (£49,969).

Glenfield & Kennedy—Interim dividend of 5% for nine months (5% for year). In compliance with the Companies Act, 1948, the directors have arranged that the financial years of all companies within the group shall end on the same date, and it is proposed that the next accounts of the company should be presented in June, 1949, for the nine months' period ending December 31, 1948.

Aeroplane & Motor Aluminium Castings—Trading profit, plus transfer fees, for the year ended March 31, £76,392 (£36,491); to directors' salaries, £9,500 (£6,000); fees, £350 (same); audit fee, £350 (£458); depreciation, £17,372 (£10,723); balance, £48,820 (£18,960); brought in, £30,800 (£30,895); to tax, £26,175 (£9,000); written off goodwill, £11,000 (£5,930); dividend, paid as an interim, 12½% (7½%); forward, £35,570.

Thompson Bros. (Bilston)—Balance of trading profit to July 31, £163,006; investments income, £413; from contingencies reserve, £2,000; E.P.T. relief, £1,262; to directors' remuneration, £20,298; audit fee, £400; depreciation, £13,477; income tax, £49,000; profits tax, £21,500; leaving £62,003; investments reserve, £47; brought in, £23,693; final dividend of 7½% and bonus of 10%, making 25%; benevolent fund, £2,000; general reserve, £35.000; forward, £31,692.

William Sugg & Company—Balance brought forward from revenue account for the year to June 30. £88,711 (£46,581); interest received, £5,005 (£1,825); provision not required, £2,174 (nil); to taxation, £36,682 (£12,000); directors' emoluments, £16.190 (£11,584); net profit, £28,188 (£15,782); dividend of 10% and bonus of 15% (same); to stock reserve, £6,000 (nil); reserve,

£3,601 (nil); forward, £21,998 (£19,550, less directors' additional remuneration 1946-47, £1,023).

Edge Tool Industries—Group's trading profit for the year ended June 30, £254,074; miscellaneous income, £1,751; to depreciation, £19,965; directors' emoluments, £22,148; auditors' remuneration, £553; tax, £117,289; general reserve, £16,000; price fluctuations reserves, £22,500; dividends to parent company, £29,150; undistributed profit to parent company's balance sheet, £1,954; to subsidiaries' balance sheet, £26,266; parent company's net profit, £31,104; to final dividend of 12½%, making 20%, £24,200; preference dividend, £4,950; forward. £6,531 (£4,577).

Cochran & Company Annan—Trading account balance to June 30, £144,232 (£100,659); provisions of earlier years no longer required, £1,456 (nil); to depreciation and special writings off, £17,789 (£11,954); directors' fees, £1,250 (£1,000); other emoluments, £11,995 (£15,359); auditors, £340 (£297); property revenue account (excess of expenditure for year), £1,076 (£1,416); bank interest, £482 (£882); doubtful debts, £1,000 (nil); total taxation, £62,901 (£43,311); net profit, £48,855 (£33,438); to general reserve, £25,000 (£20,000); retirement benefits, £10,000 (nil); preference dividend, £1,375; final ordinary dividend of 5%, making 6½%, tax free (same); forward, £6,864 (£4,134).

Chadburns (Liverpool)—Trading profit for the year to March 31, £60,583 (£35,837); E.P.T. repayment, nil (£9,691); net surplus on sale of assets, £127 (nil); transfer fees, £12 (£18); to general expenses, including repairs and renewals, £48,843 (£43,126); income tax, £482 (same); managing director's remuneration, £3,598 (£2,150); depreciation, £4,248 (£4,269); profit, £3,551 (loss £4,481); interest for 1941-47 on value payment in respect of Cyprus factory, £1,140 net (nil); war contingency reserve not required, £1,000 (nil); cost reserve written back, nil (£5,596); provision for sundry liabilities written back, nil (£1,123); written off special expenditure on foundations and valuation of plant, etc., £5,464; adjustment relating to previous years, £564; N.D.C., nil (£8,500); dividend of 3% (nil); forward, £4,164 (£5,491).

Thos. W. Ward—Group trading profit for the year ended June 30, £1,654,687, of which £972.883 is attributed to the parent company and £681,804 to subsidiaries; miscellaneous income, including reserves no longer required, dividends, etc., £1,894,645; total charges, £1,135,138; total allocations for replacement of fixed assets, pension scheme, future tax, £146,889; disposable balance, £612,618; to minority interests, £37,246; carried forward in subsidiary companies' accounts, £38,376; for appropriation in parent company's accounts, £536,996; parent company's profit, after tax, £477,233 (£295.959); dividends received from certain subsidiaries in respect of periods prior to consolidation, £66,379; reserves not required. £70,000; capital profits on realisation of fixed assets. £58,369; to reserve for replacement of fixed assets, £60,000; cost of initiating pension scheme, £49,574; pension scheme reserve. £25,000; preference dividends, £38,750; employees' shares dividend, £6,667; ordinary dividend of 15% (same); reserve. £260,000 (£150,000); forward, £309,179 (£167,938).

Personal

MR. L. R. LIPKIN has been appointed a director of S. Guiterman & Company, Limited.

MR. C. N. GALLIE has resigned from his position as chairman of the Southern Regional Board for Industry because of ill-health.

MR. R. D. TALBOT, a director of the Talbot-Stead Tube Company, Limited, Walsall, has been elected to fill a casual vacancy on the Walsall Town Council.

SIR HAROLD WEST, managing director of Newton Chambers & Company, Limited, Sheffield, has received a presentation from the company's management and staff to mark the occasion of his recent knighthood.

MR. S. J. L. HARDIE has relinquished the chairmanship of Sentinel (Shrewsbury), Limited, machine-tool manufacturers, etc. MR. E. CARNEGIE has joined the board and will become chairman. MR. W. P. WRATHALL has resigned from the board.

MR. H. A. BILLINGHURST, of Wemyss Lodge, Larbert, Stirlingshire, has been appointed to succeed the late Mr. John Knight as representative for the whole of Scotland of Follsain-Wycliffe Foundries, Limited, and Varatio-Strateline Gears, Limited.

MR. W. CAMPBELL ALLAN, secretary of Richardsons, Westgarth & Company, Limited, and associated companies, is retiring at the end of the year; he will be succeeded by MR. F. R. MOBERLY. Mr. Allan will continue as a director of the company.

DR. C. H. LOBBAU, formerly Head of the Department of Civil and Mechanical Engineering and Professor of Civil Engineering at King's College from 1935-46, has had the title of Professor Emeritus of Civil Engineering conferred on him by London University.

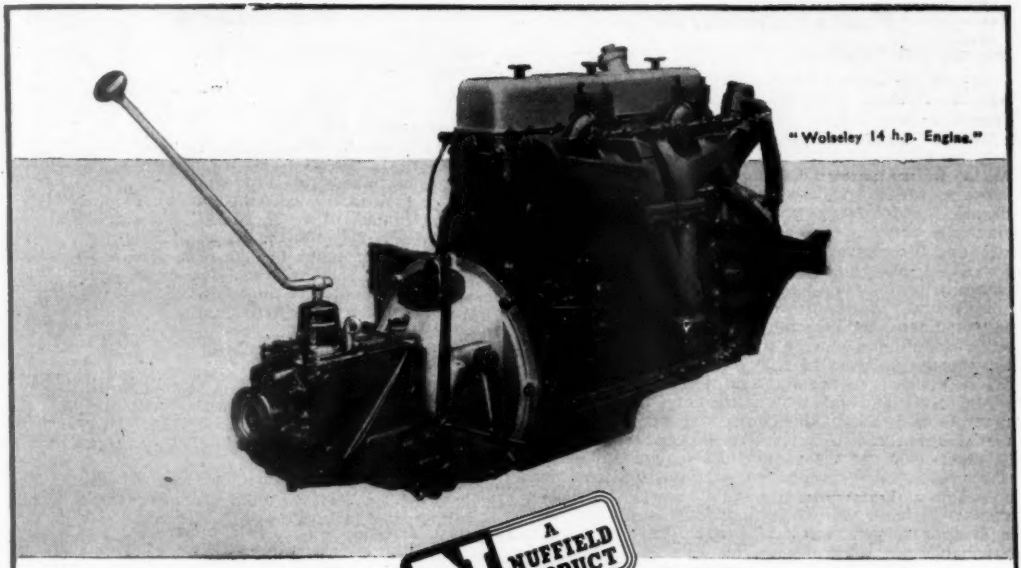
MR. HENRY R. WILKINS, a director of Wilkins & Mitchell, Limited, machine-tool and power-press manufacturers, etc., of Darlaston, Staffs, has left England on a business trip to Australia, New Zealand and America. He is expected to return early in December.

MR. W. J. WEAVER, a local director of Wm. H. Muller & Company (London), Limited, iron, magnesium and chrome importers, etc., has been appointed as a representative of the Middlesbrough and District Chartered Shipbrokers' Association in succession to MR. J. W. MOORE, who has resigned.

MR. CHARLES CONNELL, of Charles Connell & Company, Limited, Glasgow, has been elected president of the Clyde Shipbuilders' Association for the ensuing year in succession to MR. G. W. BARR, managing director of the Fairfield Shipbuilding & Engineering Company, Limited, Govan, who remains an office-bearer in the capacity of ex-president. MR. P. GIFFORD, managing director of D. & W. Henderson & Company, Limited, Glasgow, and MR. JOHN G. STEVENS, a director of Alexander Stephen & Sons, Limited, Govan, have been appointed vice-presidents of the Association, while MR. L. V. DUNLOP, of Harland & Wolff, Limited, has been re-elected treasurer.

Will

YOUNG, MARK, formerly of the Consett Iron Company, Limited £1,623



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THE STANTON IRONWORKS COMPANY LIMITED, Nr. NOTTINGHAM

Parliamentary

Iron and Steel Subsidies

MR. WADSWORTH asked the Minister of Supply what was the amount of subsidies for which the iron and steel trade had had the benefit in 1945, 1946 and 1947.

MR. G. R. STRAUSS, in reply, said that figures were not available for 1945. During the year ended March 31, 1947, the total Government expenditure on subsidies for iron and steel was about £11,250,000 and during the following year about £11,500,000. The difference between the cost of imported pig-iron and steel and the controlled price in this country accounted for £3,800,000 and £3,600,000 respectively, of these payments.

MR. ELWYN JONES asked the Minister of Supply if he would name the iron and steel companies which had received subsidies during the last three years; what was the amount paid to each company; and what conditions attached to the granting of the subsidies.

MR. STRAUSS said that particulars of the exact amounts paid to individual firms were not immediately available, but he was having the information collected. Payments were made to companies required to undertake uneconomical production to meet the need for maximum output. The conditions under which payments were made varied with individual companies, but in every case care was taken to ensure that only a reasonable rate of profit was made.

Overseas Subsidiaries of Iron and Steel Companies

When MR. ERROLL asked the Minister of Supply which of the companies listed in the Third Schedule of the Iron and Steel Bill had wholly-owned subsidiaries in overseas countries, MR. G. R. STRAUSS said that as certain subsidiaries of Third Schedule companies were registered overseas, particulars of the ownership of their share capital were not readily available, and his information as to wholly-owned subsidiaries might therefore be incomplete. He gave the names of the following companies, which, according to his present information, had wholly-owned overseas subsidiaries:—Guest, Keen & Nettlefolds, Limited; Hadfields, Limited; John Lysaght, Limited; John Summers & Sons, Limited; Richard Thomas & Baldwins, Limited; Stewarts and Lloyds, Limited; and the Millom & Askam Hematite Iron Company, Limited.

IMPORTS OF iron and steel and manufactures (excluding cutlery and machinery) into Eire in September were valued at £420,012, against £384,934 in the corresponding month of 1947. The value for the first nine months of 1948 was £4,869,979, against £3,331,217. Imports for September, compared with the corresponding month of last year, included the following items:—Pig-iron, 144 tons, valued at £2,970 (24 tons, £340); iron bars and rods, 27 tons, £1,023 (68 tons, £2,129); steel bars and rods, 401 tons, £14,128 (418 tons, £17,332); iron and steel squares and flats, 461 tons, £17,730 (299 tons, £12,337).

Obituary

MR. ANGUS MACLEAN, a former principal of Paisley Technical College, died on November 6.

MR. JOHN KNOX MARR, formerly proprietor of James G. Marr & Son, shiprepairers, etc., of Edinburgh, died on November 1.

MR. THOMAS STEEN, who died suddenly on November 3, was a director of Thomas Steen, Limited, weighing machinists, of Burnley.

MR. J. J. BOANSON, assistant manager of the Wolverhampton branch of P. A. Mudd, Limited, boiler repairers, etc., has died at the age of 47.

MR. EDWARD HENRY PARKER, who died at his home at Clarkston on Sunday, was a former secretary of the Institution of Engineers and Shipbuilders in Scotland.

MR. FREDERICK WILLIAM CASHMORE, chairman of John Cashmore, Limited, iron and steel stockholders, etc., of Tipton, Staffs, died on November 5 at the age of 65.

MR. REGINALD BEDE HAGUE, a partner in the firm of C. R. Hague & Company, metal merchants, etc., of Sheffield, died suddenly on October 25. He was one of the founders of the firm about 22 years ago. He was 48 years of age.

MR. FREDERICK G. DUNLOP, senior director in England of Harland & Wolff, Limited, shipbuilders, of Belfast, died in London on November 7. He joined Harland & Wolff, Limited, in 1901 as a draughtsman, and prior to his appointment to the directorate in 1937, when he transferred to the London office, he was shipyard manager. Mr. Dunlop was awarded the O.B.E. in 1920.

Changes of Name

The following companies have recently changed their names, the new titles being given in parentheses:—

ROWAY CASTINGS, LIMITED, West Bromwich (Roway Metals, Limited).

GULF RADIATOR COMPANY, LIMITED, London, S.W.1 (Gulf Radiator Company, Limited).

FOLLSAIN METALS, LIMITED, Lutterworth, near Rugby (Follsain-Wycliffe Foundries, Limited).

HAW & HOLROYD, LIMITED, precision engineers, etc., of Bradford (A. & F. Holroyd, Limited).

AFCO MARINE PRODUCTS, LIMITED, Luton (Foundry & Engineering Products (London), Limited).

EMBARKALL, LIMITED, agents for engineering plant, etc., of London, W.C.1 (Clark, Ellison & Company, Limited).

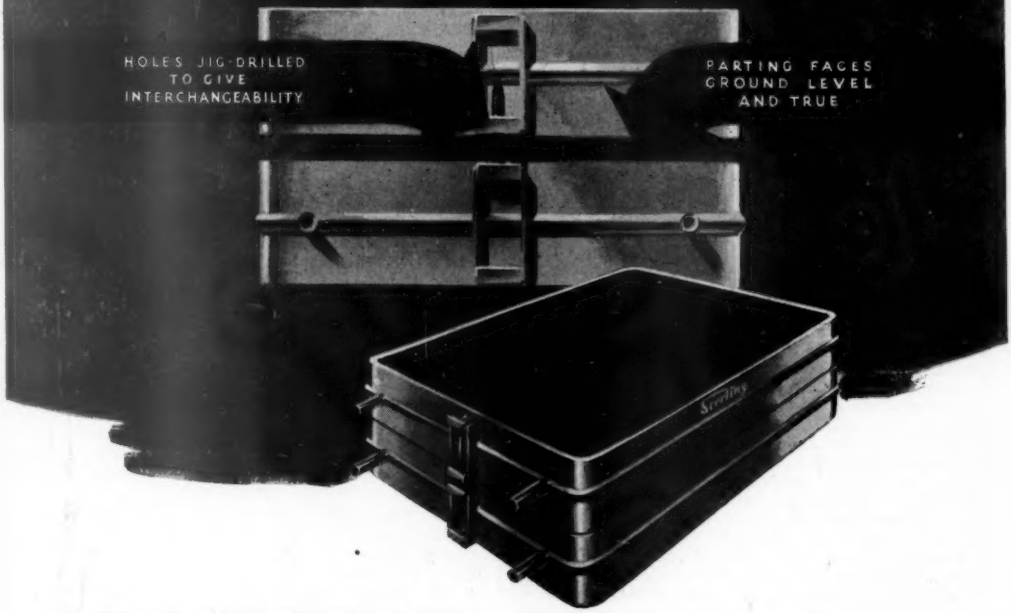
STAR VEHICLE ENGINEERING COMPANY, LIMITED, London, E.C.2 (Star Vehicle Engineering Company (B.T.C.), Limited).

WELLINGTON (REDDITCH), LIMITED, manufacturers of metal and small-ware goods, etc. (Howard S. Cooke & Company, Limited).

ANDREWS GRAYSON & COMPANY, LIMITED, brassfounders, engineers, etc., of Otley, Yorks (W. R. Andrews (Welders), Limited).

S.P.C. (ENGLAND), LIMITED, mechanical and general engineers, etc., of London, N.4 (Standage Power Couplings, Limited).

DESIGN FOR ACCURACY



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News in Brief

TWENTY-NINE EMPLOYEES of the British Oxygen Company, Limited, who have been with the company for more than 25 years, have received long-service awards.

SATURDAY MORNING WORK in the Clyde shipyards and engineering establishments was resumed on November 6 for the first time this winter. Attendance was satifactory.

THE PURCHASE of British Klockner Switchgear, Limited, Chertsey, Surrey, from the custodian of enemy property by Dorman Smith Holdings, Limited, has been completed.

SEVERAL HUNDRED WORKERS of Barclay, Curle & Company, Limited, shipbuilders, of Glasgow, held a one-day strike recently because of a misunderstanding over a pay cut.

STOTHERT & PITT, LIMITED, Bath, has received a contract, valued at between £170,000 and £200,000, for 20 modern 3-ton electric quay cranes for sheds at the Royal Edward Dock, Avonmouth, Bristol.

THE MINISTER OF LABOUR (Mr. George Isaacs) said at Swansea on November 8 that when all the industrial projects planned for South Wales were in operation, there would be jobs for all in the area.

SCOTTISH SHIPYARDS during October launched 14 vessels of 67,500 tons gross to make their total output for the 10 months of this year 98 vessels of just under 350,000 tons gross, compared with 375,000 tons gross in the same period of last year.

JOHN FOWLER & COMPANY (LEEDS), LIMITED, manufacturers of agricultural machinery, etc., is making application for a quotation for the whole of the 5½ per cent. redeemable cumulative preference shares (£242,700). No market operation is involved.

WOODS OF COLCHESTER, LIMITED, manufacturing electrical and ventilating engineers, announces that on and after December 2 the company's London office will be at Fenwick House, 292, High Holborn, W.C.1 (telephone: Chancery 8284 and Holborn 1381).

TWENTY-FOUR transportable power stations are being manufactured by two Peterborough companies, Peter Brotherhood, Limited, and Mitchell Engineering, Limited, for Russia. The value of the contract, which is to be completed in 2½ years, approaches £500,000.

AIR CONTROL INSTALLATIONS, LIMITED, Ruislip, Middx, is opening a branch office in Birmingham. Mr. A. W. Evans has been appointed as Midland area manager. Inquiries should, for the present, be addressed to him at 6, Buryfield Road, Solihull, Birmingham (telephone: Solihull 1718).

THE BIRMINGHAM BRANCH of Cox & Danks, Limited, held a staff social evening on November 5. The staff with their wives and friends, numbering some 140 all told, visited a theatre before going on to Dudley Castle for dinner, where they were welcomed by a local director, Mr. E. Pitt, and Mrs. Pitt.

MR. RAFAEL GARCIA, a young Spanish engineer, has been awarded a British Council bursary which will enable him to spend three months in Britain working at a rolling mill. He is a technical designer in the rolling mill of Altos Hornos de Viscaya. Mr. Garcia is working at the Shotton works of John Summers & Sons, Limited.

H.M.S. CHESTERFIELD, one of the U.S. destroyers transferred to Britain in 1940, has arrived in the Tyne to be broken up at the yard of Clayton & Davie, Limited, Dunston. Another former U.S. destroyer, H.M.S. Charlestown, has arrived in the Wear, and will go into the yard of Thomas Young & Sons (Shipbreakers), Limited, at Sunderland.

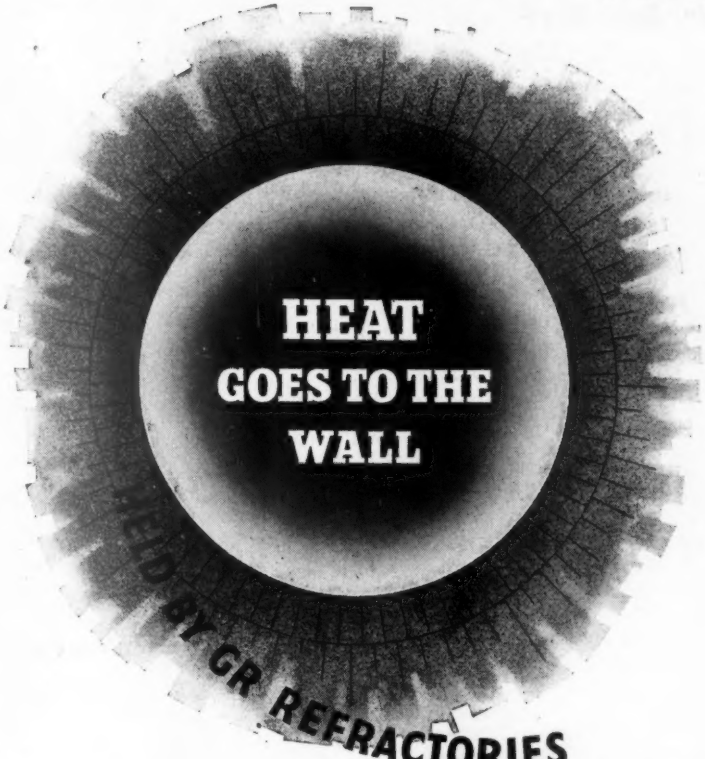
MAJOR, ROBINSON & COMPANY, LIMITED, engineers and merchants, of Manchester, announces that building has commenced on its new factory in Warwick Road South, Stretford, Manchester, which, it is hoped, will be completed about June, 1949. Arrangements have been made that the eventual move to the new premises will in no way interfere with production.

THE EXECUTIVE COUNCIL of the Boilermakers' Society has upheld the decision of the union's Belfast district committee that the platers of Harland & Wolff, Limited, should carry out the work which recently led to the dispute between them and welders belonging to the same union. The Council ruled that the welders on strike over the line of demarcation should return to work immediately. The welders decided on November 10 not to resume work.

THE DIRECTORS OF Guest, Keen & Nettlefolds, Limited, have drawn the attention of their stockholders to the difficulty of fully assessing the effect which the Iron and Steel Bill may have in regard to dividends and profits of the holding company. The Bill proposes control of dividend payments from October 29, 1948. The rate of the interim dividend (4 per cent.) now declared on the ordinary stock, they state, must, therefore, not be taken as a guide to the rate of the final dividend for the financial period.

KIPP KELLY, LIMITED, 68, Higgins Avenue, Winnipeg, Canada, is anxious to contact U.K. manufacturers of mining machinery and equipment with a view to undertaking their representation in Canada. Interested companies should communicate direct with the sales manager of Kipp Kelly, Limited (Mr. H. R. Sheppard), at the same time notifying the Export Promotion Department, Board of Trade, Room 1073, Thames House North, Millbank, London, S.W.1 (reference E.P.D. 42219/48), of any action taken.

ING J. MURE NADAL, commercial manager and director of the Cia. Argentina de Talleres Industriales Transportes y Anexes S.A. (generally known as C.A.T.I.T.A.), Buenos Aires, is visiting the United Kingdom on business towards the end of this month. The company wishes to acquire railway material (comprising locomotives and wagons, permanent-way equipment, etc.), metal-working machine tools, well-boring equipment, agricultural machinery, gas meters and gas water heaters. Interested U.K. companies should contact Ing J. Mure Nadal on his arrival in England (c/o Mr. K. L. Terry, 1A, Cavendish Square, London, W.1), at the same time notifying the Export Promotion Department, Board of Trade, Thames House North, Millbank, London, S.W.1 (reference, E.P.D. 42015/48), of any action taken.



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Raw Material Markets

Iron and Steel

Orders on hand at the foundries are sufficient to ensure maximum output for some time ahead. Difficulty is being experienced, however, in meeting the normal requirements for pig-iron and, consequently, no reserves can be accumulated to allow for any expansion in output. A better supply of scrap would ease the position. Production of low- and medium-phosphorus iron is steady, and with fairly good supplies of hematite and refined iron available, the engineering, jobbing and speciality foundries are able to maintain an even flow of castings. Limestone and ganister are in fairly good supply, as also are ferro-alloys, but firebricks for cupola linings are difficult to obtain promptly. Foundry coke deliveries are generally up to allocations.

There continues to be a far-reaching demand for all re-rollers' products to meet the call for home and export requirements. The light re-rollers have a heavy demand for the smaller square and flat billets, and supplies which are being obtained from Belgium are proving very useful. There is no slackening in the call for small sections, bars, and narrow strip. Good tonnages of heavier steel billets, blooms and slabs are being received by the heavy re-rollers, and outputs are satisfactory. Ready acceptance is given for defective billets, slabs and crops or any other suitable re-rolling material.

Plate-mill production is on an impressive scale, but supplies, nevertheless, cannot possibly cope with the demand. These conditions are even more strongly accentuated in the sheet trade, and buyers are queuing up for the second half of 1949. Reconstruction and new construction work on a big scale are causing a heavy call for joists and sections, and forward inquiries for rails and other track equipment ensure full employment for this branch of the trade for a long period ahead.

Non-ferrous Metals

The outstanding feature of the non-ferrous metal trade last week was the strength of copper in New York; this was mainly due to the continuation of the strike at the Utah mine, where something like 5,000 tons a week is being lost. At the time of writing no settlement of the dispute has been reached and there is no indication that an agreement is in sight. The present year has been marked by a number of labour disputes in the United States, and it is not long since a prolonged stoppage at one of the chief lead-producing concerns was eventually resolved. The copper supply situation in America is, of course, growing worse daily and there are ever-present fears of an advance in the price of the metal. It has been reported that a leading domestic producer has been taking orders for December only on the understanding that the metal would be invoiced at the price ruling on the date of despatch. The big producers are reported to be averse to any further advance in price beyond 23½ cents per lb., for they realise that this will mean a claim for higher wages, which, in turn, brings higher costs. But it is often the consumers who precipitate a change in the quotation by their eagerness to pay "over the odds" in order to secure supplies. In addition, so far as copper is concerned, it is possible for a merchant in America, having secured a parcel of copper, to arrange for its conversion into electro by one of the custom smelters before selling at a "made" price which may be well above the current rate charged by the producers of primary metal from ore.

Tin-mining companies appear to be doing quite well on the basis of the present price for their metal, but, nevertheless, it is reported that some of the Continental countries are not so keen to take up quotas as they were and that deliveries of tin are beginning to slacken. World production of tin metal in August amounted to 13,200 tons, which was 2,000 tons less than the exceptionally good total of 15,200 tons in July. Consumption during August amounted to 11,000 tons and at the end of July world stocks of tin in concentrates and tin metal amounted to 146,000 tons, hardly an unsatisfactory figure. Reserves of tin in the United Kingdom are quite good and certainly much better than lead, which at the end of September fell below 19,000 tons, compared with some 26,000 tons at August 31. This is a dangerously low level, even with consumption at a reduced rate, and it is much to be hoped that efforts will be made to increase it.

New Patents

The following list of Patent Specifications accepted has been taken from the "Official Journal (Patents)." Printed copies of the full Specifications may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2, price 1s. each. The numbers given are those under which the Specifications will be printed, and all subsequent proceedings will be taken.

603,784 ENGLISH ELECTRIC COMPANY, LIMITED, and CHADWICK, G. Fastening metal parts together by a process involving electric heating.

604,033 FAIRWEATHER, H. G. C. (National Smelting Company). Melting furnaces.

604,043 FOUNDRY SERVICES, LIMITED, and STRAUSS, K. Metal casting.

604,056 GRUBB, K. T. Electrolytic polishing of metallic surfaces.

605,555 ECCLES, G. O. and TALBOT, G. L. Forging of metals

WHILE EVERYTHING POSSIBLE will be done to remove unemployment among shipbuilding and ship-repair workers, the prospect of securing shipbuilding orders is remote, states the Eire Department of Industry and Commerce in reply to a request of the Dublin Trades Council for steps to be taken to resume shipbuilding at Dublin.